CHAPTER IV

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter of the Final EIS discusses the analysis and prediction of the environmental consequences associated with the selection and implementation of each of the six alternatives described in Chapter 2. In the analysis of environmental consequences, the impacts of each alternative are presented separately.

ENVIRONMENTAL CONSEQUENCES ALTERNATIVE 1. RESTORATION OF GRIZZLY BEARS AS A NONESSENTIAL EXPERIMENTAL POPULATION WITH CITIZEN MANAGEMENT(THE PREFERRED ALTERNATIVE)

Impacts on Human Health and Safety

To identify actual risk factors, it would be best to compare areas of similar habitat, human population and recreational activities, and grizzly bear densities, both projected for recovery and expected during the implementation phase. The Northern Continental Divide Ecosystem (NCDE), outside of Glacier National Park, has habitats similar to those in the northern portion of the BE, has grizzly bear population densities of about 1 bear per 20-30 square miles (similar to projected recovered grizzly bear densities for the BE), and has human recreation consisting of hiking, fishing, camping, horseback riding, and big game hunting. Glacier National Park annually receives approximately 2-3 million visitors, does not allow hunting, and has grizzly bear population densities estimated at about 1 bear per 8 square miles. The Yellowstone Ecosystem (YE) which is comprised of Yellowstone Park and surrounding National Forests, receives more visitation than Glacier Park and has an increasing grizzly bear population estimated at 1 bear per 30-50 square miles. Consequently, it would be more comparable to estimate risk to human safety based on habitat and bear densities that occur in the NCDE and YE outside of the national parks, because conditions in these areas most closely resemble those that would occur over time in the BE.

Within the NCDE (outside of Glacier National Park) there has been one bear-inflicted human mortality and one injury since 1950. The injury rate in the YE outside of Yellowstone Park has increased over the last two decades and averages about one injury per year outside the Park, until 1997 when 6 people were injured outside the Park. Within the YE (outside Yellowstone Park) there have been three grizzly bear-inflicted human mortalities in the last 159 years. Gunther (pers. comm. 1998) believes bears, elk, and hunters are concentrating in the residual timber stands following the extreme fire season of 1998. Bears are learning to search for elk and deer carcasses and viscera piles left by hunters.

Although risks of encounters with bears resulting in injury do exist, they are frequently exaggerated. Risks in the BE after bear recovery (a minimum of 50, and likely more than 110 years) would probably mimic those incurred in the NCDE (outside of Glacier National Park). Grizzly populations in the NCDE estimated at a minimum of 325 bears in 1998 are presently about one-and-one-half times the levels expected in the BE within 50-110 years. In the NCDE, only two known bear inflicted injuries have occurred since 1950 outside of Glacier Park. In the Bob Marshall Wilderness in 1956, a hunter shot and injured a grizzly bear that responded by mortally injuring the hunter. In 1985, a bird hunter in the Mission Valley shot and wounded a grizzly that responded by injuring the hunter. National Forests keep some statistics of visitor use called Recreational Visitor Use Days (RVDs). RVDs estimated for the Bob Marshall Wilderness since the last injury occurred in 1956, indicate that the chance of injury in the Bob Marshall Wilderness would be a maximum estimate of

1 injury per 4.5 million RVDs (1956-1994). Similar data were not available for the YE, but due to the injuries of 1997, the rate would be higher.

Presently, the human population levels within and surrounding the NCDE and the YE are greater than those in the BE. Because more than 98% of the BE occurs on national forest lands, resident human populations will likely not increase substantially. However, visitation would likely increase over the recovery period, until saturation of recreation use has occurred, or wilderness managers limit use to reduce impacts. Presently, visitation to the Selway-Bitterroot and Frank Church-River of No Return Wilderness Areas is approximately 1% of that occurring in Glacier and Yellowstone Parks. It is likely that human use of the national forest lands in central Idaho will increase within a few decades, but will likely never reach visitation levels presently occurring in or near Glacier or Yellowstone National Parks.

During the first several decades following reintroduction, the chance of injury caused by grizzly bears would be exceedingly small due to the low density of bears in the area. For instance, in the Selkirk and Cabinet/Yaak ecosystems where there is a low density recovering populations of grizzly bears, there have not been any recorded injuries in at least the last 20 years. Similar injury rates would be expected in the Bitterroot Ecosystem until bear and human densities increased beyond those presently occurring in the SE and CYE. Using human injury rates in the NCDE and YE, and recognizing a net increase in human visitation, projections for human injury, once bears are recovered 50-110+ years in the future would likely average less than one injury per year, and less than one bear-induced human mortality every few decades.

Under Interagency Grizzly Bear Committee (IGBC) guidelines (IGBC 1986), grizzly bears posing problems to camps, cabins, individuals and stock may be relocated or removed. Other potential management options also may be used, such as aversive conditioning techniques that train individual bears to avoid humans or human properties. Radio telemetry collars would be placed on all bears released in the wilderness. This would allow for surveillance of the animals' movements, and allow for preemptive management actions should a bear be in an area where they may come into conflict with humans. A proactive information and education program would increase the awareness of the general public and backcountry users about grizzly bears, allowing for improved and safer food storage and use of stock in and around hunting, fishing, and other recreational campsites. These monitoring controls should further reduce the risk factors to humans using the wilderness and surrounding national forests. Whether grizzly bears would be recovered as a nonessential experimental population or a threatened population would also dictate management flexibility and perhaps subsequent associated risk of injury.

Humans that act in self-defense or defense of others would continue to be allowed to kill a grizzly bear. In addition, new technologies such as repellants, proper sanitation procedures, aversive conditioning, monitoring, and preemptive management, as well as educating humans how to react during an encounter would reduce chance of injuries. See Appendix 11 for more information on risks to human safety.

Conclusions.— During the first several decades following reintroduction, chance of injury caused by grizzly bears would be exceedingly small due to the low density of bears in the area. Under this alternative populations are estimated to achieve recovery levels of approximately 280 bears in a minimum of 50 years, and could likely take more than 110 years. Using human injury rates in the NCDE and YE, and recognizing a net increase in human visitation, projections for human injury, once bears are recovered 50-110+ years in the future, are less than one injury per year and less than one grizzly bear-induced human mortality every few decades.

Impacts on Source Populations of Grizzly Bears

Under ESA Section 10(j), the Secretary of Interior may authorize the release of any population of an endangered or threatened species outside the current range of such species if the Secretary determines that the release will further the conservation of the species, and the population is wholly separate geographically from nonexperimental populations of the same species (See Appendix 12). Reintroduction of grizzly bears into the BE would require capture and relocation of a minimum of 25 bears over a 5-year period from other areas. Some undetermined level of mortality is expected among the transplanted bears. Every effort would be taken to minimize this, but mortalities are expected to occur. Any transplanted bears that died or were removed as a result of human action could be replaced. Such replacements would be in addition to the original minimum of 25 bears.

Three sources of bears for the BE have been identified: southeast British Columbia, the Northern Continental Divide Ecosystem (NCDE) population in northwest Montana, and the Yellowstone Ecosystem (YE) population. An equal contribution of bear numbers would be made from Canada and the United States. MDFWP has stated their willingness to use grizzly bears from the NCDE to augment populations elsewhere or reintroduce the species where recovery areas have been identified (Dood and Ihsle Pac 1993, page 107). An attempt was made to transplant a grizzly bear to the Cabinet Mountains from the NCDE in 1992 but trapping efforts to capture a subadult female were not successful (Kasworm et al. 1993).

The relocated bears would be lost from these populations and this loss would be a man-caused loss similar to a mortality. Losses of bears from populations through human-caused actions are regulated and limited to assure the health of these populations. Any captures and removals of bears from source populations would have to be factored into these human-caused mortality limits. Any removal of grizzly bears from within the NCDE or YE recovery zones or within 10 miles of the recovery zone boundary would count against the mortality quota. Some mortality in subadults would be compensatory. If the NCDE or YE populations exceed existing mortality limits in any year, then the placement of grizzly bears to the BE from these ecosystems would be suspended for the following year.

Current mortality data for the YE show for 1996 and 1997 the annual total human-caused mortality limit as measured on a running 6-year average was not exceeded, and the female mortality limit as measured on a running 6-year average was exceeded in both years. In 1998, both the total and

female mortality limits were not exceeded for the YE (Table 3-6). To exceed the Recovery Plan (USFWS 1993) parameters, these limits must be exceeded for two consecutive years. The YE annual total mortality limit was not exceeded in 1997 and 1998, and annual female mortality limit was exceeded in 1997 and met in 1998. For the NCDE, human-caused annual total and female grizzly bear mortality limits was not exceeded in 1996. In 1997, the annual total mortality limit was not exceeded and the female mortality limit was exceeded (Table 3-7). Since these data are updated each year, it is necessary to recalculate mortality levels for both the NCDE and YE prior to making a decision on the origin of any relocated bears. The specific number of grizzly bears that could be obtained from the NCDE or YE is unknown at this time. The female contribution would be designed to minimize impacts on the source population and no female grizzly bears would be removed from within the NCDE or YE recovery zone boundary or from within 10 miles outside the boundary. The male contribution could be a higher number because population increase is affected little by removal of subadult males (USFWS 1993, Eberhardt et al. 1994). Since no bears would be removed from the YE or NCDE if the mortality limits would be exceeded, and no female bears would be removed from within the recovery zone or within 10 miles of the recovery zone boundary of either ecosystem, then the effects on recovery of any removals of bears from the NCDE or YE would be nonexistent.

It should be stressed that any contribution of bears will be based on the current mortality levels. These mortality levels change and the mortality limits are recalculated annually. Contributions of bears to the BE from both the NCDE and the YE would be based on the results of this annual mortality recalculation, and the potential for contribution could change.

Impacts to YE and NCDE Source Populations.— Removals of bears from within either the NCDE or YE recovery zones or within 10 miles of the recovery zones for purposes of transplanting to the Bitterroot area, must be accounted as mortalities in the annual calculations under Recovery Plan standards. Summaries of mortality for the NCDE and YE are shown in Tables 3-6 and 3-7. Recovery Plan standards for mortality are based on 6 year averages of total mortality and female mortality. These averages were first calculated in 1992 and are complete through 1998. In the NCDE, average female mortality limits were exceeded in 4 of the last 7 years but average total mortality limits were not exceeded in any of the years from 1992 to 1998. In the YE, average female mortality limits were exceeded in 3 of the last 7 years and average total mortality limits were exceeded in 1 of the last 7 years. Counts of females with cubs are used to estimate minimum populations (USFWS 1993). Removals of adult female grizzly bears from either recovery zone or the 10 mile area surrounding each recovery zone may also affect minimum population estimates by reducing the number of potential females with cubs that could be observed. Total mortality limits are calculated from minimum population estimates and any reduction in females could indirectly affect these limits and grizzly bear recovery in these ecosystems. Therefore, USFWS has determined that removal of any females from the NCDE or YE recovery zones or within 10 miles of those recovery zones for the Bitterroot reintroduction program will not occur. Removal of male bears does not affect the population estimates which are based on sightings of females with cubs, though these removals must still be accounted under total mortality as a bear lost from the recovery zone. If one male bear had been removed from the NCDE each year, total mortality limits would not have been

exceeded in any of the 7 years from 1992 through 1998. Total mortality limits would have been exceeded in 1 year if 2 male bears had been removed from the NCDE each year. If one male bear had been removed from the YE each year, total mortality limits would have been exceeded in 1 of the 7 years from 1992 through 1998. Total mortality limits would have been exceeded in 2 years if 2 male bears had been removed from the YE each year.

Several researchers have noted polygamous breeding structure in grizzly bears whereby males may breed with several females and females may breed with several males within a single breeding season (IGBC Compendium 1987). This breeding structure should minimize any adverse effects from removal of males from the population. Adult males are most commonly involved with breeding, therefore removal of subadult males would be less likely to affect courtship and breeding structures.

Removal of bears from the area more than 10 miles from recovery zones would not affect recovery criteria as these animals are not counted toward Recovery Plan standards (USFWS 1993). Either males or females could be used as transplant stock for the Bitterroot reintroduction effort. Removal of either adult or subadult females from the area greater than 10 miles from the recovery zone, could however still affect the population of bears living in this area because of less reproductive effort in subsequent years. Removal of males, particularly subadult males would be much less likely to affect the population because they contribute less to breeding than adult males.

Impacts to British Columbia Source Populations.— A minimum of 25 bears would be introduced over a 5-year period with an equal contribution of bear numbers coming from the U. S. and Canada. To estimate potential effects, the following scenario was analyzed. If, for example, the total reintroduction of a minimum of 25 bears over a period of 5 years (estimate at least 5 bears/year) is implemented and the NCDE and/or YE together contribute 3 bears/year, then 3 bears/year would probably come from British Columbia's Kootenay Region. If the long-term harvest average in the Kootenay Region is 55.7 bears/year as it has been in the past, then 3 additional bears removed for reintroduction into the BE would result in an increase in the harvest in the Kootenay Region to 58.7 bears/year for 5 years. This would result in an increase in the average harvest rate from 2.56%/year to 2.70%/year for the next 5 years. This appears to be within the management objectives of the British Columbia Ministry of Environment, Lands, and Parks, however meeting these objectives is dependent upon which of the 15 GBMUs (grizzly bear management unit) provide the bears for reintroduction. If it is not acceptable to add the removal of 3 bears per year to the existing harvest level, then there could be a reduction in existing harvest in those GBMUs where the 3 bears would be removed. That decision would be made by British Columbia management authorities. As Simpson et al. (1995) and others (USFWS 1993) stress, the percentage of the female harvest is critical to population rate of change and is much more important to limit than male mortality levels.

Simulations of the growth rate of the reintroduced population have assumed an initial population having 15 female bears (see Figure 2-3). Additional males may not be contributing to reproductive output, but additional males may be necessary to assure having adequate males present at the start

of population growth because males are more likely to travel farther and will likely be subject to higher mortality levels.

The ability of southeast British Columbia to contribute bears to the BE is dependent upon agreement by the British Columbia provincial government that such removal of bears from British Columbia is compatible with their management objectives, and the support of local citizens and sportsmen for such management actions.

Conclusions.—It appears that source areas for reintroduction of grizzly bears into the BE could be both the NCDE and/or YE (based on mortality levels) in Montana and the Kootenay Region in British Columbia, Canada. These areas have habitat similar to the BE and have sufficient numbers of bears to be a source area. Agreement to supply grizzly bears is not an assurance that bears having history of no conflict with humans, and proper age and sex will be available to the BE reintroduction program. The actual capture of the necessary bears is dependent upon access to areas with such bears, and significant effort by capture crews. Capture of desired bears is not assured, even with intensive effort. It may require more than 5 years to obtain the desired minimum of 25 bears to initiate a new population in the BE. This should be made clear to the public and to cooperating agencies at the outset. There would be no significant detrimental effects to the health of source populations because mortality limits in the Grizzly Bear Recovery Plan (USFWS 1993) and British Columbia grizzly bear management criteria (B.C. Min. Environ., Lands, and Parks 1995) would be met during implementation of this alternative. Further, since no bears would be removed from the YE or NCDE if the mortality limits would be exceeded, and no female bears would be removed from within the recovery zone or within 10 miles of the recovery zone boundary of either ecosystem, then the effects on recovery of any removals of bears from the NCDE or YE would be nonexistent.

Impacts on Land-Use Activities

The preferred alternative includes the reintroduction of a population of grizzly bears to be designated "experimental" and "nonessential" (refers to an experimental population whose loss would not likely reduce the survival of the species in the wild) under the ESA amendment 10(j). Federal agencies would only have to confer with the USFWS on activities that are likely to jeopardize the species. Grizzly bear management under the preferred alternative would allow for resource extraction activities to continue without compliance with Section 7 consultation or Section 9 “takings” provisions under the ESA. No constraints on private land management actions and private lands are included in Alternative 1, and none would be included in the Special Rule if Alternative 1 is selected.

Alternative 1 indicates that the CMC would review any potential impacts to land uses and assure that resource extraction activities would be maintained in the BE. Alternative 1 also indicates that existing USDA Forest Service (USFS) Forest Plan standards and guidelines, as amended, would be deemed adequate pending review by the CMC. The CMC would be responsible for recommending changes in land-use standards and guidelines as necessary for grizzly bear management. It is

anticipated that laws and regulations in the BE, in effect at the time of issuance of this FEIS, and governing land management activities would promote grizzly bear recovery.

Impacts on Timber Harvest.— It is expected that timber harvest is an activity that can be compatible with grizzly bear recovery as long as it meets the existing standards and guidelines of the USFS Forest Plans. Road density guidelines presently in effect in the Clearwater and Nez Perce National Forest Plans outside the wilderness areas are assumed to be adequate for grizzly bear recovery (see Appendix 10). If this alternative is implemented, the special rule would allow the CMC to make recommendations for changes to agency management plans. The CMC could make recommendations to land and game management agencies regarding changes to plans and policies, but the final decision on implementation of those recommendations would be made by those agencies, and the requirements of NEPA could apply. Changes to the Forest Plans should be reviewed by the CMC and agency biologists to determine potential impacts.

Impacts on Minerals Extraction.—Mineral extraction would likely not be altered due to grizzly bear concerns in and by themselves. Recommendations would be made by the CMC to reduce potential impacts if the need arises.

Impacts on Domestic Livestock.— Elements of the preferred alternative that would likely influence impacts on domestic livestock include: 1) reintroduction of grizzly bears into central Idaho, with management as a nonessential experimental population under Section 10(j) of the ESA; 2) intensive monitoring of grizzly bears to identify potential conflict sites; 3) control by public agency personnel of any bears depredating on livestock; 4) the option allowing private landowners to harass or kill grizzly bears that are depredating livestock on private land (following permit and protocol), when agency personnel are not able to resolve the problem.

Grizzly bears would be released in areas of central Idaho that have low densities of livestock. During the first few decades after this alternative is implemented, bear numbers and depredations of livestock are expected to be very low. Following grizzly recovery, grizzly bears would be removed from ESA protection and the states of Idaho and Montana would continue to manage bears.

Most livestock depredations by grizzly bears in the 14 county PAA are expected to occur in the 18,489,989 acre block of contiguous USDA Forest Service land. In addition, depredations could occur in a thin band of surrounding private land.

During the summer grazing period, approximately 30,344 cattle and calves and 40,064 adult sheep and lambs are distributed on public grazing leases across the experimental population area (Table 3-13). Some livestock on private land surrounding public lands may be susceptible to grizzly bear predation.

Grizzly depredation on livestock is highly variable between years and among areas. Projection of depredation rates from other areas is difficult because terrain, vegetation, size of farms, livestock husbandry practices, and food abundance will differ among areas. The following mathematical equation was developed by wolf biologists (USFWS 1994) and is being applied here to standardize depredation rates from the Yellowstone (YE) and Northern Continental Divide Ecosystems (NCDE) in relation to total livestock and recovered bear numbers in the Bitterroot (280 bears) and estimate livestock losses.

$$\frac{\text{Number of cattle/sheep (Bitterroot Ecosystem)}}{\text{Number of cattle/sheep (Other Ecosystem)}} \times \frac{\text{Number of grizzly bears (Bitterroot)}}{\text{Number of grizzly bears (Other Ecosystem)}} \times \text{Mean annual depredations (Other Ecosystem)} = \text{Estimated annual depredations in Bitterroot}$$

Livestock present in the Yellowstone Ecosystem during 1992 were 146,000 cattle and 265,000 sheep (USFWS 1993). Livestock losses from the YE averaged 35 cattle per year during 1994-97 (Gunther et al. 1995, 1996, 1997, 1998). Sheep losses attributable to grizzly bears in the YE averaged 29 sheep per year during 1994-97 (Table 4-1). The YE grizzly bear minimum population estimate used for calculating livestock depredations was 245 bears (Eberhardt and Knight 1996) because the population estimate applied to the time period analyzed. Application of the equation to these data from the YE results in an estimate of 8 cattle and 5 sheep taken annually by a recovered grizzly bear population (280 bears) in the BE (Table 4-2).

Table 4-1. Cattle and sheep losses and incident reports involving grizzly bears from the Yellowstone Ecosystem, 1994-1997 (Gunther et al. 1995, 1996, 1997, 1998).

Year	Cattle Losses	Sheep Losses	Indicents[a]	Human Injuries
1994	19	0	135	9
1995	41	0	101	3
1996	30	47	24	2
1997	51	69	36	8
Average 1994-1997	35	29	74	5.5

[a] Incidents include property damages, and conflicts involving human foods, garbage, gardens, orchards, and beehives.

Numbers of livestock grazing on public lands within the NCDE is less than either the YE or BE and allotments occur largely on the east side of the NCDE. However, livestock losses also occur on private lands within and adjacent to the NCDE in addition to those occurring on allotments. Losses of livestock to grizzly bears in the NCDE and peripheral lands including the Blackfoot Indian Reservation have averaged 8 animals per year from 1986-94 (Madel 1996, D. Carney, pers. comm.

1996). Losses of sheep to grizzly bears in the NCDE including the Blackfoot Indian Reservation have averaged 17 animals per year from 1986-94 (Madel 1996, D. Carney, pers. comm. 1996). Estimates for total cattle were based on grazing allotments and numbers from the Blackfoot Indian Reservation. Estimates for total sheep were based on grazing allotments, numbers from the Blackfoot Indian Reservation, and numbers on private lands adjacent to public lands along the East Front. Livestock totaled 34,841 cattle and 8,500 sheep. The minimum grizzly bear population for the NCDE was calculated from sightings of females with cubs during 1993-1995 as specified in the Recovery Plan (USFWS 1993) to be 516 bears. This minimum population estimate was used for calculating livestock depredations because it was applicable to the time period analyzed. Application of the formula to standardize depredation results in an estimated loss of 4 cattle and 44 sheep annually in the BE when grizzly bear populations are fully recovered at a population of 280 (Table 4-2). Because livestock are in low numbers in the northern portion of the recovery area where bears are expected to exist in highest densities, livestock depredations could be less than either the NCDE or the YE. These predictions are statistical in nature and are not intended to show exact depredation expected in the BE, but should provide an indication of what may occur based on other ecosystems. Livestock losses have been reduced significantly in the last 3 years through modifications in animal husbandry practices such as the use of electric fences, removal of livestock carcasses, use of guard dogs, and conscientious herding practices (Madel 1996).

Table 4-2. Estimated livestock losses in the Bitterroot Ecosystem based on cattle numbers, grizzly bear numbers and rate of loss due to grizzly bears in the Yellowstone Ecosystem and the Northern Continental Divide Ecosystem. The livestock losses for the Bitterroot Ecosystem are projections based on rate of loss in the other ecosystems and are based on a recovered grizzly bear population of 280 individuals managed under experimental status described in Alternative 1.

Area	Minimum grizzly bear population (1996 estimate)	Cattle present	Average annual cattle losses (%)	Sheep present	Average annual sheep losses (%)
Yellowstone Ecosystem	245[a]	146,000	35 (0.024 %)	265,000	29 (0.1 %)
Northern Continental Divide Ecosystem	516[a]	34,841	8 (0.023 %)	8,500	17 (0.2 %)
Bitterroot Ecosystem recovery goal (experimental population area)	280	30,334	4-8	40,064	5-44

[a] YE and NCDE grizzly bear minimum population estimates used in depredation calculations are consistent with the years analyzed. The current minimum population estimates are listed in Chapter 3, “Source Populations”.

As provided in Alternative ,1 the public would be allowed to harass a grizzly bear attacking livestock (cattle, sheep, horses, and mules) or bees. A livestock owner may be issued a permit to kill a grizzly bear killing or pursuing livestock on private lands if it has not been possible to capture such a bear

through agency efforts. If there would be significant conflicts between grizzly bears and livestock within the experimental area, these could be resolved in favor of the livestock. There would be no federal compensation program, but compensation from existing private funding sources would be encouraged.

Impacts on Other Private Property.— Other types of conflicts occur between humans and grizzly bears. These include incidents where bears obtain anthropogenic foods (e.g. garbage), damage property, damage bee hives, and obtain fruits and vegetables from orchards and gardens. It is difficult to estimate the potential nuisance problems that could occur in the BE based on what is occurring in other ecosystems because of the differences between ecosystems. The core of the BE is National Forest and wilderness with very few population centers. Yellowstone and the NCDE both have a combination of wilderness and intensive areas of human use. Both of these ecosystems are likely to provide more opportunity for conflicts than the BE because the areas of human impact in the BE are predominately on the perimeters of the ecosystem.

The 1986-1990 nuisance situations involving property damage, garbage, beehives, and other problems in the NCDE averaged 26 incidents per year with most of the problems being garbage related (Dood and Pac 1993). The Yellowstone ecosystem usually has considerably more problems than the NCDE and during 1994 -1997 an average of 74 nuisance situations were handled involving property damage, garbage, bee hives and orchards and gardens in the YE (Gunther et al. 1995, 1996, 1997, 1998). Many of the situations occurred in just 1 of the bear management units. Sixty-three percent of the nuisance incidents involved sanitation problems where bears obtained garbage or other human food, 24% property damage, 7% bee hives, and 7% orchards.

Based on what is currently known about bear behavior in these other ecosystems, once bears are recovered in the BE, bear incidents would likely range between 0 and 74 per year. However, by the time bears would be recovered in the BE, conflicts should be greatly reduced because much more would be known about proper sanitation and avoiding many of the potential conflicts between bears and man.

Conclusions.—Livestock grazing, although presently either not occurring or at very low densities within the recovery area, is not expected to be impacted. However, within the experimental boundaries, grazing occurs predominantly in the southern portion of the BE (Figure 3-8, Table 3-13). Consequently, at recovered grizzly population levels and current livestock stocking rates, impacts to livestock would be expected to be similar to levels occurring in portions of the NCDE and the YE. In 50-110+ years (the estimated time to recovery assuming a 2-4% growth rate) grizzly bears would likely be present within the southern portion of the BE. Projections indicate that at a grizzly bear population level of 280 bears in the recovery area, yearly livestock losses to depredation by bears could range from 4-8 cattle and 5-44 sheep. Management activities would try to preempt livestock problems. The CMC would try to make all uses compatible with recovery.

Restoration of a nonessential experimental population of grizzly bears into the BE is not expected to impact existing land uses in the BE, including timber harvest and minerals extraction activities. Based on what is currently known about bear behavior in the NCDE and YE, once bears are recovered in the BE (a minimum of 50 years, and likely more than 110 years after reintroduction), nuisance bear incidents would likely range between 0 and 74 per year. However, by the time bears would be recovered in the BE, conflicts should be greatly reduced because much more would be known about proper sanitation and avoiding many of the potential conflicts between bears and humans.

Impacts on Wildlife Populations

Grizzly bears are omnivores, but primarily feed on vegetation. Studies indicate that a grizzly bear diet consists of about 90% vegetable and insect matter. They do scavenge and occasionally prey on game animals, in addition to ground dwelling rodents they actively dig out of dens. Research has documented the importance of local concentrations of ungulates as a source of protein for grizzly bears (IGBC 1987). In many locations, animal matter may not constitute a major annual diet item, but may be seasonally vital to bears (Mattson et al. 1991, Gunther and Haroldson In press).

Several studies have attempted to estimate predation by grizzly bears. Studies in the YE indicate that some grizzly bears are active predators on elk calves. Researchers made 944 sightings of grizzly bears on elk calving grounds over 5 years and documented 70 hunts for elk calves of which 26 were successful (Gunther and Renkin 1990). These researchers noted that the percentage of successful hunts declined dramatically during July as calves became more mobile. Mattson (1997) indicated that grizzly bear predation rates averaged 1.4 or 5.8 ungulates per year for adult female and male bears, respectively. Mattson found that bears preferred small prey in the form of elk and moose calves and occasionally adults. French and French (1990) found that although some bears were active predators, not all bears were very successful or even attempted to prey on elk calves. The authors further suggested that predation on elk calves is a learned behavior and is likely facilitated when cubs are raised by predacious mothers. Ungulates, especially elk, were part of the diet when they were the most available and vulnerable, such as calves, winter-killed or weakened animals during spring (Green and Mattson 1988), and weakened bulls during the fall rut (Schleyer 1983).

Based on different studies conducted in North America, bear predation and effectiveness is partly a result of vegetation type and cover, and may be a local phenomenon based on a variety of conditions enhancing predation effectiveness. Although Schlegal (1976) and Gratson and Zager (1999) documented significant black bear predation on elk calves in one study area where spring bear range and elk calving areas overlap in Idaho, it is unclear if similar circumstances are more widespread. Given expected population levels and densities, grizzly bear predation impacts are unlikely to reach levels currently occurring for black bears.

Research conducted in and near Glacier National Park indicated that predation attributed to grizzly bears accounted for 2%, 0%, and 4% of the elk, deer, and moose monitored in their study area

respectively (Kunkel and Pletcher 1994). This study documented a total of 19 predator kills of elk from 1990-1995, 3 of which were caused by grizzly bears. All 3 were older elk (age 11-16). During this same time, 11 moose were known to be killed by predation, 5 of which were attributed to grizzly bears. Grizzly population density estimates for their study area are about 1 bear per 6-8 square miles (Martinka 1974, McLellan 1989), and are perhaps 10-15 times higher than density estimates expected at recovered levels in the BE (1 bear per 50-100 square miles). Therefore, when grizzly bear populations reach recovery levels in the BE, the predation rate could be a fraction of levels in or near Glacier National Park. An expected predation rate of 0.17-0.38% of the ungulate populations in the area occupied by bears could occur.

Using Mattson's (1997) estimate of 1.4 or 5.8 ungulates per year for adult female and male bears respectively, a population of 280 bears (USFWS 1996) would be expected to prey upon a maximum of 504 ungulates per year across the BE (Table 4-3). This calculation assumes a 50:50 sex ratio and a 50:50 adult subadult ratio. The loss of a maximum of 504 ungulates to a recovered grizzly bear population would represent approximately 0.11% of estimated ungulate populations in the PAA.

Table 4-3. Estimated predation on ungulates by grizzly bears in the Primary Analysis Area as a percent of the pre-hunting season ungulate populations and different grizzly population levels. Estimates resulting from two different models (Mattson 1997)[a] and (Kunkel & Pletcher 1994)[b] shown.

Grizzly bear population[c]	Annual kill of ungulates[d]		Percent of ungulate populations (%)[e]	
	Mattson Model (Mattson 1997)	Kunkel & Pletcher Model (1994)	Mattson Model (Mattson 1997)[f]	Kunkel & Pletcher Model (1994)[f]
50	90	42	0.07	0.03
100	180	85	0.13	0.06
200	360	168	0.27	0.13
280	504	234	0.38	0.17

[a] Mattson (1997) study analyzed predation of elk, moose, and bison.
[b] Kunkel and Pletcher (1994) study analyzed predation of elk, moose and deer.
[c] Population assumed to be 50% adult and a 50:50 sex ratio.
[d] Predation rate of 1.4 and 5.8 ungulates per year for adult male and female bears respectively (Mattson 1997).
[e] Total pre-hunting season elk and moose population is 133,968 (see Table 3-22).
[f] Rates based on (bears per square mile densities) x (observed predation rate) x (total elk and moose numbers in PAA).

Annual mortality in big game can result from harsh weather, hunters, disease, predation, and other factors. These factors can interact to accentuate or negate the other. For instance bad weather may concentrate big game to make them more susceptible to hunting, predation, or disease. Furthermore an animal weakened by disease may be more susceptible to predation or winter kill. These factors make it difficult to determine whether a 0-1% grizzly predation rate would be compensatory or

additive. In addition, annual fluctuations in weather can cause ungulate populations to increase or decrease by as much as 10-15%. Such a reduction occurred between the winters of 1994-1997 in the northern PAA. Idaho Game Management Units 10 and 12 experienced a 40% population decline during this period. Research has indicated predation by black bears and mountain lions in this area can be a significant cause of calf elk mortality, and likely has contributed to the population decline in this area (Gratson and Zager 1999). The restoration of grizzly bears would likely have an impact on black bear use of the ungulate resource through competition. This would likely mask any potential grizzly predation of 0-1% on ungulates within the PAA. It should therefore not be necessary to adjust hunting seasons to compensate for grizzly bear predation.

Grizzly and black bear population relationships have also been studied in selected areas. Mattson et al. (1992), documented one instance of an adult male grizzly bear preying upon a black bear in the YE. They also found that less than 0.15% of the 6,979 grizzly bear scats examined contained remains of black bears. During a 1984 drought in the North Fork of the Flathead River, grizzly bears from Glacier National Park made greater use of river bottoms typically frequented by black bears (Jonkel 1984). Black bears were less common in the river bottom during this time and may have been displaced or preyed upon by grizzly bears. Still, areas in Glacier Park have extremely high densities of both grizzly and black bear populations. Based on Park observation records (Glacier Park unpublished data 1980-1984, Nadeau pers. comm. 1996), a spatial partitioning of resources occurs as black bears and grizzly bears frequently occupy and forage in separate areas, thus avoiding conflict and maximizing foraging effectiveness. Researchers in Wyoming have found where grizzly and black bears coexist, black bears become diurnal and occupy more forested habitat than grizzly bears. Adult male grizzly bears were nocturnal and occupied open habitat, females and subadult grizzly bears were crepuscular (active at dawn and dusk) and avoided male grizzly bears (Holm, In press). Although some displacement occurs where grizzly and black bears coexist, potential long-term impacts to black bear population dynamics is unclear, but felt to be minimal.

Impacts on Listed Wildlife and Fish.— An Intra-service Section 7 evaluation of the impacts of grizzly bear recovery in the BE on other resident listed wildlife and fish species was conducted by the USFWS. The resultant Biological Assessment (BA) and letter of concurrence are included in FEIS Appendix 9A. The BA indicates the proposed action would benefit the grizzly bear; would not likely adversely affect gray wolves, bull trout, and lynx; and would have no effect on the other wildlife and fish species analyzed. Impacts to listed anadromous fish species from grizzly bear recovery in the BE were analyzed in a Biological Assessment prepared by the USFWS and reviewed by the National Marine Fisheries Service (NMFS). The results of the Section 7 consultation between USFWS and NMFS are documented in a Biological Opinion prepared by NMFS which is included in FEIS Appendix 9B. NMFS determined that grizzly bear recovery in the BE would not likely jeopardize the continued existence of Snake River steelhead, sockeye salmon, and spring/summer chinook salmon species or result in destruction or adverse modification of critical habitat.

Conclusions.—In many locations, animal matter may not constitute a major annual diet item, but may be seasonally vital to bears (Mattson et al. 1991). An expected predation rate of 0.17-0.38%

of the ungulate populations in the area occupied by grizzly bears at recovered levels in the BE could occur. Using Mattson's (1997) estimate of 1.4 or 5.8 ungulates per year for adult female and male bears respectively, a population of 280 bears (USFWS 1996) would be expected to prey upon a maximum of 504 ungulates per year across the BE. The loss of 504 ungulates to a recovered grizzly bear population would represent approximately 0.11% of estimated pre-harvest populations of ungulates in the PAA. Potential long-term impacts to black bear population dynamics is unclear, but felt to be minimal. Overall impacts of a recovered population of grizzly bears on other wildlife populations are expected to be minimal. It should not be necessary to adjust hunting seasons to compensate for grizzly bear predation on other wildlife. Any restrictions on black bear hunters or other hunting opportunities to reduce the likelihood of mistaken identity kills or to address other potential conflicts could be recommended by the CMC, but would have to be acceptable and implemented by the IDFG and MDFWP. Grizzly bears will kill some healthy ungulates, but a large percentage of prey killed by bears will be very young, very old, sick, injured, or otherwise disadvantaged. Consequently, fewer ungulates will die from malnutrition associated with winter stress. To a small extent, competition among ungulates for food and space will be reduced, and the health of surviving ungulates may be increased an undetermined, but probably minimal amount. Grizzly bear recovery in the BE would not significantly impact other listed wildlife or fish species (Appendices 9A and 9B).

Impacts on Public Access and Recreational Use

Visitor use.—Visitors in the BE may have an opportunity to observe grizzly bears. A recently conducted scientific public survey (Duda and Young 1995), asked "if grizzly bears were put in the Bitterroots next year, would it change the number of future trips you would take"? Eighty-one percent of the locals, 85% of the regional, and 84% of the national respondents said it would not change the number of future trips they would take. Two percent of the locals, 4% of the regional and 7% of the national would take more trips. Fifteen percent of the locals, 7 percent of the regional, and 6% of the national would take fewer trips. Local and regional respondents who visited the Bitterroots in 1994 indicated that they spent a median of 6-10 days, and national respondents spent a median of 4 days that year in the Bitterroots. However, a higher percentage of locals visited the Bitterroots at some time (74%), compared to regional (21%), and national (6%) (Duda and Young 1995).

Of those respondents who said they would take more trips if grizzly bears were introduced, locals (2% of respondents) indicated that over the next 3 years they would take 2 to 15 trips (mean of 6), and regional (4% of respondents) and national (7% of respondents) would take 1-3 trips. Of those locals who said they would take fewer trips (15% of respondents), 49% of the them would take 0 trips, and 30% would still take 1 to 32 trips each year for the next 3 years. Of the regional respondents who would take fewer trips (7% of respondents), 76% said they would take 0 trips, and 10% said they would take 1 trip over the next 3 years. Of the national respondents who would take fewer trips (6% of respondents), 95% would take 0 trips.

Current use of the PAA measured in RVD's (Recreational Visitor Days) was 13,268,395 in 1995. There is no information available as to the breakdown of the percent of local, regional and national

outdoor recreationists in the PAA. Therefore, there is no real way to determine the change if any expected in the annual RVD's following reintroduction. We know that some people will avoid the PAA, and some will be attracted to the PAA because of bears. However, what is not known is what impacts an increase of 1% national visitation would have on the PAA. Annual RVD's increased about 7% in central Idaho between 1993 and 1995, and will continue to increase as the demand for wilderness and outdoor recreation areas increases nationally. Consequently, despite some possible temporary changes in visitation rates (up or down) as a result of grizzly bear restoration, little overall change in increasing visitation rates would be expected over time. Visitation will continue to increase as a result of expanding population pressures and the subsequent increased demand for outdoor recreation opportunities. Also, there is no way of predicting the number of people who will continue to recreate despite an initial avoidance of the PAA, once they feel comfortable that the benefits outweigh the minimal risks involved.

Nature study, hiking, walking, camping, and off-highway vehicle use activities in Idaho are all projected to experience moderate to high growth to the year 2010. Hunting activities in Idaho are projected to experience slow growth to the year 2010 (IDPR 1989). The expected impacts to backcountry user groups such as outfitters and rafters could include increased requirements to store food so it would be unavailable to grizzly bears, and to keep clean camps so as not to attract bears. This would enhance human safety and minimize human impacts on a wide range of wilderness resources including other wildlife species and water quality. Appendix 22 provides a preliminary report on sanitation improvements needed throughout the BE for all wildlife species, and could apply to grizzly bear recovery efforts.

Trail and Road Closures.—This alternative allows for a citizens management committee to decide if trails, roads, and other areas would be closed to improve recovery efforts for grizzly bears. No trail or road closures in the BE are expected solely for grizzly bears at this time. In the NCDE where a minimum population of about 325 grizzly bears (1998 estimate) currently exist, only one trail was closed on national forest lands because of grizzly bears in the last 10 years (USFS, Unpubl. data 1996). This closure was a result of concerns for human safety when a bear was seen feeding on an elk carcass on a trail. During the peak of the visitor use season in Glacier National Park, fewer than 5% of the trails are closed at any time as a result of safety concerns. Because of the difference between national park and national forest management, closures in the BE would most likely be extremely rare and probably be similar to the NCDE, and be based on a citizens group recommendations. In the event trail use restrictions for public safety are necessary in response to a rare instance such as a grizzly bear feeding on a carrion source, such restrictions would be short-term.

Hunting seasons.—Under this alternative, there are no proposed changes in hunting seasons. It is predicted that 280 grizzly bears would kill a maximum of 504 ungulates per year. Interactions with other predators and the compensatory nature of some predation may affect the total loss of ungulates to predators, but at this rate only 0.11% of the pre-harvest ungulate population would be preyed upon

by a recovered bear population. This small loss of ungulates is not expected to result in changes of big game seasons.

In some areas where grizzly bears and black bears coexist, black bear hunting techniques have been limited to avoid mistaken identity mortality. Baiting and hound hunting are currently not allowed in Montana, as a result of concern for bear management. Baiting and hound hunting were eliminated decades before the grizzly bear was ever listed under the ESA. In the Selkirk mountains of northern Idaho, baiting and hound hunting are not allowed in units where grizzly bears exist. Any changes in baiting and hound hunting would have to be authorized by the Idaho Fish and Game Commission. The Citizens Management Committee could recommend these changes occur as a way to reduce mistaken identity or other illegal mortality to grizzly bears. However, due to the remote character and inaccessibility of the Recovery Area which is designated wilderness, bait and hounds are seldom used during black bear season. Therefore, any changes recommended would likely have little impacts on the wilderness hunter who seldom ever baits and seldom hunts with hounds for fear of losing dogs.

Conclusions.—Under this alternative, the Citizen Management Committee may recommend changes to current management practices in the BE with the least impacts to resource use industries, including recreational industries, while prioritizing grizzly bear recovery. Although some people would avoid recreating in the recovery area as a result of reintroduction, other people would increase their recreation in the area because of it. The vast majority of recreationists and resource area users would continue to use the recovery area with little change in their trip frequency or length. Backcountry user groups such as outfitters and rafters could be impacted by increased requirements to store food and keep clean camps so as not to attract bears. Over time, recreation and visitor use of the PAA would continue to increase. No changes in hunting seasons are currently anticipated as a result of grizzly bear recovery, although changes could be recommended by the CMC to state agencies to address potential conflicts.

Impacts on Economics and the Social Environment

Background Information for Analysis.—An economic analysis of the effects of grizzly restoration into the Bitterroot Ecosystem necessarily entails examining each potential source of economic costs or benefits and estimating its net economic effect. The areas of potential economic effects examined are the following: (1) effects on hunter harvest, (2) effects on livestock depredation, (3) effects on land use restrictions, (4) effects on visitor use, and (5) effects on existence values. These areas will be discussed in turn and the cumulative effect of all sources of benefits and costs will be examined.

The following estimates of the economic consequences associated with the alternatives for grizzly reintroduction include impacts on local populations as well as impacts on the national population. Additionally, the estimates include both expenditure impacts, or impacts from increasing or decreasing local area expenditures, and non-market value impacts, or estimated economic impacts not tied to market transactions. In interpreting the estimated economic impacts of the alternatives,

it is important to note what the specific framework for each cost or benefit is, and on what population each predicted cost or benefit falls.

Effects on hunter harvest (1) potentially have two possible economic impacts: an expenditure impact and a non-market net economic value impact. Any expenditure impact would come from reduced expenditures in the PAA resulting from hunters living outside of the PAA deciding not to hunt in the PAA. These expenditure reductions would impact the businesses where the lost expenditures would otherwise have been made. Net economic value impacts associated with hunting restrictions are non-market losses which accrue to hunters because they spend less days hunting. These losses do not represent lost market transactions, but rather the lost increment of value to the hunter which is above the market expenditures (e.g., gas, food, ammo) that he/she must make for that hunting day.

Effects of livestock depredation (2) fall on the rancher losing the livestock. This is a direct expenditure , or income loss. If there were a compensation program (such as exists for the gray wolf recovery program) for ranchers, then the impact of livestock losses would be shifted from the individual ranchers to contributors to any compensation trust fund.

Effects associated with land use restrictions (3) could potentially impact recreation, timber harvest, or mineral extraction. Impacts on recreation would be felt through reductions in expenditures made by public lands recreators. Non-market losses would also be felt by potential recreationists who might have their recreation in the BE restricted. Restrictions on timber harvest and mineral extraction would be felt in local economies through loss of business expenditures, loss of employment, and loss of employee expenditures. The negative impacts of land use restrictions would be primarily expenditure losses in the local economies.

Effects on visitor use of the recovery area (4) would have two components, expenditure impacts and non-market net economic value impacts. Either increases or reductions in visitation to the recovery area by people living outside of the PAA would be associated with increased or decreased trip-related expenditures in the PAA. These increases or decreases in trips would also likely be associated with positive or negative (respectively) impacts to trip-related net economic value for the visitors. The impact of any visitation-related expenditure changes would fall primarily on area businesses, and the impact of net economic value changes would fall to the visitors themselves.

Effects on existence values (5) are described in detail in the following sections. These impacts to existence values accrue to both users and non-users of the recovery area. Existence value impacts are entirely non-market impacts. Since existence value impacts potentially affect everyone in the country, not just individuals in the PAA, the vast majority of these impacts fall to individuals outside of the PAA.

Impact on the Economic Value Associated with Hunter Harvest.—One of the potential effects of grizzly restoration to the Bitterroot Ecosystem is on big game hunting opportunities in hunting units/districts in or near the recovery area. As discussed previously in the section on the effect of restoration on wildlife populations, grizzly bear recovery is not expected to have any significant effect on huntable populations of ungulates in the BE. It is not expected that restrictions on black bear hunting in wilderness areas would occur under this alternative. However, hunters could suffer an economic loss associated with grizzly restoration if future restrictions on black bear hunting in the recovery area result in a decrease in total days spent hunting black bears in the region (see Alternative 4 analysis, this Chapter).

Economic Impact on Domestic Livestock.—A second area of potential costs associated with grizzly restoration to the BE is the possibility of livestock depredation by the recovered grizzly population. The calculation of lost value due to this depredation is straightforward. The lost value per year is equal to the estimated number of lost animals per year times the market value of those animals. For a discussion of how the estimates of livestock depredation in the Bitterroot Ecosystem were computed, see Chapter 4, Impacts on Domestic Livestock.

Grizzly depredation on domestic livestock would likely be minimal during the estimated 50-110+ years until the population of grizzly bears in the BE is fully recovered. It is estimated that after a recovered population of 280 grizzly bears is achieved, depredation incidents involving livestock would be between 4 and 8 cattle and between 5 and 44 sheep per year. Prior to full recovery depredation losses are expected to be below these estimated levels. Table 4-4 shows the estimated losses due to predation on livestock under Alternative 1. It is estimated that between $2,720 and $8,568 dollars per year in livestock predation losses would occur if grizzly bears were reintroduced to the BE under Alternative 1.

Table 4-4. Annual economic costs associated with livestock depredation under Alternative 1.[a]

Statistic	Low estimate	High estimate
Cattle lost	4	8
Average value per cow[b]	$565	$565
Sheep lost	5	44
Average value per sheep[b]	$92	$92
Total lost value per year	$2,720	$8,568

[a] During the first few decades after reintroduction, bears numbers and depredations are expected to be very low. Impacts as presented in this table would occur after grizzly bear population recovery in approximately 50-110+ years.

[b] Average value per head figures are based on an average of the Montana and Idaho value for all cattle and all sheep in the states as of January 1, 1996 (Montana and Idaho Departments of Agricultural Statistics, pers. comm. 1996).

Economic Effect of Land Use Restrictions on Recreation.—It is expected that any land use restrictions due to the restoration of grizzly bears to the BE would not result in lost economic value. While some area visitors may be inconvenienced due to occasional temporary trail closures, this inconvenience is unlikely to result in any appreciable loss of economic value. Therefore, for all proposed alternatives the net economic cost due to land use restrictions on recreation is estimated to be zero.

One aspect of restrictions on recreation which would have distributional effects within the economy concerns the potential imposition of regulations requiring outfitters operating within the recovery area and backcountry recreationists to include horsepackers and river rafters, to use bear-proof garbage and food containers and methods when in the backcountry. The purchase of bear-proof containers or hoists would impose an additional expense on the outfitters operating within the recovery area and individual backcountry recreationists. These costs would represent transfers of income between the outfitters and backcountry users, and those individuals or firms producing and selling the bear-proof products.

Economic Effect of Land Use Restrictions on Timber Harvest.—Timber harvest is an activity that can be compatible with grizzly bear recovery as long as it meets the standards and guidelines of the USFS Forest Plans. Current USFS Forest Plans for the Clearwater and Nez Perce National Forests outside of wilderness areas are adequate for grizzly bear recovery (see Appendix 10). Therefore, under Alternative 1 it is not anticipated that grizzly bear recovery in the BE would have an economic effect on current timber harvest plans.

Economic Effect of Land Use Restrictions on Mineral Extraction.—Mineral extraction would not likely be altered due to grizzly bear concerns in and by themselves. Therefore, under Alternative 1 it is not anticipated that grizzly bear recovery in the BE would have any economic effect on mineral extraction in the area.

Economic Effect of Changes in Visitor Use.—Grizzly bears are a high profile species with interest nationwide. A survey of Yellowstone National Park visitors found that respondents ranked the grizzly bear highest among wildlife species they would most like to see on their trip to the park (Duffield 1992). Restoration of grizzly bears under Alternative 1 would further increase national awareness of the presence of this species in the lower 48 states. While some individuals might wish to see a grizzly bear in the wild, others might wish to avoid the possibility of encountering one of these large mammals. Possible effects of this increased awareness might be increased or decreased visitation to the recovery area. Table 4-5 shows how different groups of respondents answered the question, "If grizzly were present in the Bitterroot Mountains, would you visit the area more frequently, less frequently, or the same frequency as you currently do?" (Duda and Young 1995).

It should be pointed out, however, that to a majority of respondents the presence of grizzly bears would not change their visitation patterns to the BE. It appears that those respondents closest to the recovery area (the local sample) are the most apprehensive about visiting the BE with grizzly bears

Table 4-5. Comparison of anticipated visitation patterns with grizzly bear reintroduction in the Bitterroot Ecosystem, by population group.

Statistic	Local Sample	Regional Sample	National Sample
% who would visit more often	1.8%	3.5%	5.3%
% who would visit less often	11.9%	6.2%	6.0%
% who would not change visitation	84.62%	87.2%	86.3%
% who "don't know"	1.75%	3.1%	2.5%
Sample size	286	289	285

Source: Duda and Young (1995).

present. Nearly 12 percent of this sample said they would visit the BE less often with bears present while only 1.8% said they would visit more often. Given the sample sizes and high percentage of respondents in every sample group who anticipate no change in trips to the BE, it appears that changes in visitation resulting from grizzly bear restoration would be minimal under this alternative. Based on survey responses, no significant increase or decrease in visitation to the BE resulting from restoration is anticipated.

Economic Effect on the Value Potential Visitors Place on Grizzly Bears.—A final area of potential change in economic value associated with grizzly bear restoration to the BE is the value potential visitors and others place on having a recovered grizzly population in the area. There are two components to this value. There is value associated with seeing grizzly bears in the wild. There is also what is called "passive use value" or "existence value". Existence value is the value a person associates with the knowledge that a resource exists, even if that person has no plans or expectations of ever directly using that resource (Krutilla 1967). In the case at hand, the resource being valued is a recovered or recovering population of grizzly bears in the BE.

Explanation of Existence Value. Conservation and other advocacy organizations demonstrate that individuals in the economy attach an economic value to such things as preserving endangered species, open spaces, and wilderness areas. This economic value is demonstrated through the simple fact that individuals are willing to donate money to organizations working towards these goals. Some of this demonstrated value is due to the fact that people anticipate “using” the resources they are paying to help preserve through activities such as hiking, hunting, or wildlife viewing. This portion of the value is known in economics as “use value”. Some people, however, may never intend to make any direct use of a resource, but still attach a value to the preservation of that resource. They may hold this value for a number of reasons: 1) they may want to preserve the resource for future generations (bequest value); 2) they may want to hold open the option to use the resource in some

way in the future although they have no immediate plans to do so (option value); or 3) they may simply feel that preservation of a resource is the "right" thing to do, and thus attach a value to it (existence value). The term existence value as used in this analysis collectively includes existence, option, and bequest values, but does not include any aspect of use value.

People demonstrate their existence values in the marketplace by contributing to organizations such as the Nature Conservancy, Ducks Unlimited, or Defenders of Wildlife. However, whether people enjoy existence values of resources is not contingent upon whether they donate money to support a cause. The fact that some individuals are willing to donate money is just the most obvious manifestation of these existence values.

Given the fact that existence values exist, the problem facing economists is how to measure these values without actually collecting the monetary equivalent of these values. The technique used in this analysis, contingent valuation, is the only method available to economists to measure existence values. This method has been used in hundreds of applications worldwide in the past two decades. Contingent valuation is recognized by governmental regulatory agencies such as the Department of Interior, and the National Oceanic and Atmospheric Administration as the appropriate tool for use in measuring non-use values such as existence value.

Summary of Methodology Used for FEIS Existence Value Analysis. In measuring the existence value associated with grizzly restoration to the Bitterroot Ecosystem, a sample of respondents was contacted by phone and surveyed on their knowledge and attitudes about grizzly bears and the grizzly reintroduction into the BE issue (Duda and Young 1995). One question in this survey asked respondents how much they would be willing to contribute to either support or oppose grizzly reintroduction in the BE. The average donation amount stated by the two distinct groups of respondents (those supporting and those opposing reintroduction), was used as a measure of existence value. When these average existence values were multiplied by the estimated number of people in the country who supported or opposed reintroduction, the result was an estimate of total existence values for those supporting reintroduction, and negative existence value for the group opposing reintroduction. The net economic existence value associated with grizzly reintroduction in the BE was calculated by subtracting the value for the group opposing reintroduction from the value for the group supporting reintroduction.

A necessary next step in the estimation of existence values was to make an adjustment to the stated values based on the understanding that people may *say* they are willing to contribute more to a cause than they are actually willing to contribute. To adjust for this probable overstatement, the net economic existence value estimates were reduced by approximately 70%. Finally, these lump-sum existence value estimates were annualized over a perpetual time horizon at a 7% rate. The resulting existence value was reported in the summary cost and benefits tables for the alternatives presented in Chapter 4 of this FEIS. See Appendix 17 for further information on existence values.

Details of Methodology Used for FEIS Existence Value Analysis. The methodology used in estimating the net economic value associated with a recovered BE grizzly population follows that of Duffield (1992) and Duffield, Neher, and Patterson (1993). The basic idea is to ask individuals how much they would be willing to contribute to a fund to support (or oppose) grizzly recovery. Three random samples of potential respondents were drawn: one from the pool of all possible phone numbers in the U.S. (excluding Alaska and Hawaii), a second from all possible phone numbers in a 6 state region (Idaho, Montana, Wyoming, Washington, Oregon, and Utah), and a third from all possible phone numbers in 8 counties in or near the proposed recovery area (Missoula, Mineral, Ravalli, Idaho, Clearwater, Nez Perce, Lewis, and Shoshone) (Duda and Young 1995). Individuals in these samples were contacted and surveyed as to their understanding of, and attitudes about, grizzly bear reintroduction in the BE. Appendix 17A, "Survey Questions from, The Public and Grizzly Bear Reintroduction in the Bitterroot Mountains of Central Idaho (Duda and Young 1995) Pertinent to FEIS Economic Analysis" contains those survey questions used in the economic analysis of existence values. Because reintroduction is a potentially contentious and divisive issue, it was anticipated that two distinct groups of respondents would respond to the survey: those who support grizzly bear recovery and attach a value to their existence in the BE, and those who oppose recovery and attach a value to the absence of this species from the BE. In order to determine the value which each of these unique groups attached to the recovery of grizzly bears (or their absence) respondents were asked whether they favored or opposed efforts to reintroduce bears in the BE.

The key survey question, in terms of determining the value which they might place on a recovered (or no) grizzly bear population in the BE, asked respondents if they would be willing to buy a lifetime membership in a trust fund established to support (or oppose) efforts to help reintroduce grizzly bears to the BE. The "economic good" respondents were asked to place a value on recovery of a grizzly bear population in the BE. Respondents were presented with varying dollar costs for trust fund membership. The responses as to respondents' willingness to pay for membership in the trust funds were analyzed in order to estimate the average amount those favoring (or opposing) grizzly bear recovery in the BE would be willing to pay to support (or oppose) recovery. The method of analysis of the valuation question responses followed the methods of Hanneman (1984, 1989). Table 4-6 shows the average willingness to pay to support or oppose grizzly bear reintroduction into the BE for local, region and national samples. The standard errors on the valuation estimates were derived using a method suggested by Duffield and Patterson (1991). Sample sizes for those respondents opposing reintroduction were too small to allow model estimation and estimation of an average donation. A non-parametric analysis of these responses, however, showed that average willingness to pay was substantially lower for this group than for those supporting reintroduction. This is consistent with the findings of other similar studies (Duffield 1992, and Duffield, Neher, and Patterson 1993). In order to conservatively estimate the benefits from grizzly bear reintroduction, the same average donation estimates for those supporting reintroduction was assigned to those opposing reintroduction.

It should be explicitly noted that net willingness to pay was estimated for two different groups in the population; those supporting grizzly bear reintroduction and those opposing reintroduction. To

calculate a final net economic value associated with reintroduction of grizzly bears to the BE, the net economic value associated with the absence of grizzlies from the BE for those who opposed reintroduction was subtracted from the net economic value associated with a recovering grizzly population for those who favored reintroduction. The result of this subtraction is a number that represents the net economic value associated with grizzly bear reintroduction.

Table 4-6 shows the calculation of the total net economic existence value per year of grizzly bear reintroduction to the BE. This total value figure is based on the estimated mean lifetime willingness to pay to support grizzly bear reintroduction times the number of households with phones in the relevant population (local, regional, and national samples and supporting or opposing reintroduction) times an interest rate of 7%. The individual values were aggregated to the number of households with phones because the sample was randomly drawn from all households with phones in the relevant population. The real interest rate is used in order to convert a lump-sum donation to a grizzly bear recovery trust fund into a yearly income stream. For a perpetual income stream, the lump sum amount is converted into an annual value by multiplying by the interest rate.

The aggregate net economic value per year estimates shown in Table 4-6 are conservative in several respects. First, the valuation responses were treated as household responses rather than individual responses. Treating the responses as individual responses would increase net benefits substantially. A second, smaller, source of conservative bias arises from that fact that only those households with phones were used in the aggregation. It is currently estimated that 95% of households own phones. The existence value for those homes without phones is assumed to be zero. Third, the approach to converting the lifetime contribution into an annual value is conservative in that it assumes that only the values of the present generation of contributors count. In addition, the amortization is for perpetuity; the time horizon is infinity.

These measures of the net value individuals place on having recovered grizzly bear populations are based on what survey respondents say they would be willing to donate. However, Duffield and Patterson (1991) found that the actual amount individuals will contribute may be smaller than the amount they say they will contribute. In a study of donations to improve stream flows for endangered fisheries in Montana, Duffield and Patterson found that about one third (28.6%) of the stated willingness to pay can be relatively easily collected from individuals. In order to take into consideration this difference between stated and actual willingness to contribute, we have scaled our value estimates for grizzly bear recovery by this factor (28.6%). This calibration is preliminary since the relationship between the amount hypothetically and actually paid may vary across resources and the population sampled. We do not know the exact relationship between stated and actual willingness to contribute for grizzly bear recovery in the BE. Even adjusted for an assumed difference between stated and actual willingness to contribute, the estimated existence value benefits of grizzly bear recovery in the BE is very large, on the order of $50 million per year. This large estimate reflects the large percentage of the U.S. population that supports the recovery effort and the fact that the grizzly bear is an extremely high profile wildlife species.

Table 4-6. Estimated mean values of grizzly bear reintroduction in the Bitterroot Ecosystem to potential visitors and others under Alternative 1.

Welfare Measure/Statistic	Local sample Residents	Regional sample Residents	National Sample Respondents
Mean value for those[a] supporting reintroduction (Standard Error)[b]	48.70 (4.15)	45.02 (3.48)	40.17 (3.52)
Mean value for those opposing reintroduction (Standard Error)[c]	48.70 (4.15)	45.02 (3.48)	40.17 (3.52)
Population supporting grizzly bear reintroduction	45,897	3,725,013	66,671,516
Population opposing grizzly bear reintroduction	19,363	496,668	7,439,739
Aggregate net economic value/year[d]	90,454	10,173,806	166,553,834
Scaler[e]	0.286	0.286	0.286
Estimated net economic value/year (Standard Error)	25,870 (4,939)	2,909,709 (296,475)	47,634,396 (5,142,009)

[a] The mean values are calculated as a truncated mean with the truncation level at $100.

[b] All standard errors on estimates of mean net willingness to pay were estimated using a bootstrapping procedure with 200 bootstrap iterations (Duffield and Patterson, 1991).

[c] The sample sizes for the those opposing reintroduction were not large enough to allow estimation of models of willingness to pay. The assumption was made that willingness to pay to oppose reintroduction per household was equal to willingness to pay to support reintroduction. Analysis of nonparametric means of the contingent valuation responses by those opposing reintroduction showed that this assumption likely overstates the true willingness to pay by those opposing reintroduction.

[d] Values are calculated assuming a perpetual benefit stream from a one time trust fund deposit amortized at a 7.0% real interest rate.

[e] This factor is an estimate of the ratio of the amount individuals would actually contribute to the amount they state they would contribute, based on Duffield and Patterson (1992).

Source: Bioeconomics 1999, Economic analysis for FEIS on Grizzly Bear recovery in the Bitterroot Ecosystem.

It must be noted that the willingness to pay estimates in Table 4-7 are based on the assumption that the recovery plan detailed under Alternative 1 would result in a recovered grizzly bear population in the BE. If the reintroduction plan in Alternative 1 were to fail, the benefits detailed in Table 4-7 would not be realized.

Table 4-7. Annual net social benefits associated with grizzly bear recovery in the BE under Alternative 1.

Category of Benefit / Loss	Type of Impact (Market / Non-Market)	Impacted Population / Area	Annual Impact (1996 dollars)	
			Low Estimate[a]	High Estimate[a]
(A) Benefits Associated With Grizzly Bear Recovery				
Annual net economic value of recovery	non-market	United States population	40,449,030	60,639,180
(B) Costs Associated With Grizzly Bear Recovery				
Value of hunting losses	market and non-market	hunters and local businesses	0	0
Value of livestock losses	market	ranchers[b]	2,720	8,568
Annual grizzly bear management cost during first 5 years of program[c]	market	United States taxpayers	433,632	433,632
Total costs	---	---	436,352	442,200

[a] For the benefits estimates, the low and high estimates represent a 95% confidence interval on the estimates of net willingness pay for the alternative. For the individual costs, the low and high estimates represent the best estimates of minimum and maximum costs associated with an alternative. The final net benefits figures do not represent a confidence interval but rather a plausible range of benefits associated with the alternative.

[b] If a compensation program for grizzly depredation existed, the impacted population would be the contributors to the fund.

[c] See FEIS Appendix 7 for itemized costs. After the first five years it is estimated that the Alternative 1 recovery program would cost $193,000 per year for monitoring and citizen management.

Conclusion.—It is estimated that grizzly bear recovery in the BE under Alternative 1 will lead to total benefits of approximately 40.4 to 60.6 million dollars per year and total costs of 436 to 442 thousand dollars per year for the first five years. The largest component of total costs would be the grizzly bear management costs of 433,632 dollars per year during the first 5 years of the recovery program. After the first 5 years when reintroductions are complete, the total cost would decrease to 196 to 202 thousand dollars per year.

Social Impacts

The potential social impacts from the implementation of this alternative are varied and difficult to assess. Appendix 19 contains a summary of the public comments received during the scoping process for this DEIS. This appendix provides samples of actual comments regarding views and anticipated impacts of recovering grizzlies in the BE. As such, the appendix provides an indication of potential social impacts.

In summary, impacts would be felt at various scales within society to include local, regional, and national levels. Most impacts would however occur at the local level within communities surrounding the BE. These could include impacts to lifestyles and livelihoods of local residents caused by inconveniences and damage from nuisance bear incidents (previously described in the section "Impacts to Other Private Property"). Backcountry users and outfitters could be impacted by new sanitation requirements and techniques necessary for camping and hunting in grizzly bear habitat (described under "Impacts on Public Access and Recreational Use", and "Economic Effect of Land-Use Restrictions on Recreation"). Survey results (Duda and Young 1995) indicate that some people would avoid the BE if grizzlies were present, and others would be attracted to the area given the prospect of seeing a grizzly bear. Some individuals would wish to never see a grizzly bear in the wild, and others would feel their experience was greatly enhanced by the encounter. For additional information on potential social impacts to local communities (with emphasis on Ravalli County, Montana) see the document, "Sociocultural Context for the Reintroduction of Grizzly Bears to the Bitterroot Ecosystem (in the DEIS Administrative Record).

Social impacts could result from potential changes to land-use activities ("Impacts on Land-Use Activities" section), although none are proposed under this alternative. Local and regional communities could benefit economically and culturally from tourism resulting from grizzly recovery, and this could manifest itself in social changes. Some people would experience fear from grizzly bear presence, and others would find joy in knowing grizzlies were restored to the wilds of Idaho and Montana. Traditional hunting culture would benefit from the prospect of hunting grizzly bears once the population was recovered and delisted. The Nez Perce Indians would experience a net positive impact from the return of the grizzly bear which is a powerful spiritual symbol within their culture.

Appendix 18, "Expected Timelines to Commence Implementation of the Preferred Alternative and Initial Implementation-Associated Sanitation Efforts to Minimize Conflicts", discusses the USFWS vision for implementation of this alternative. The first year of implementation would be a "phase-in" year where sanitation equipment would be installed in key areas, and information and education outreach programs would be initiated. Appendix 22 lists areas in the BE needing sanitation improvements. This would help to minimize conflicts between bears and people, and would also lessen the potential social impacts.

Environmental Justice.— An Executive Order was signed in 1994 requiring federal agencies to address the effects of federal actions on minority populations and low-income populations. This section provides the USFWS analysis associated with this issue and supplements the socio-economic analysis in the FEIS. Issues related to Environmental Justice were not identified as significant through the scoping for issues and alternatives process of through public comments received on the DEIS. Such issues were consequently not used in development of alternatives and mitigation, or considered in the effects analyses. Minorities or low income populations would not be significantly or disproportionately affected by implementation of any alternative considered in the FEIS.

Adverse Effects

The chance of human injury from grizzly bears would be minimal for the first 50 years after reintroduction. At recovered population levels, less than 1 injury per year, and less than 1 human mortality every few decades would be expected.

There are no anticipated adverse effects on source populations of grizzly bears.

Relocation of grizzly bears to the BE is expected to reduce the availability of bears for reintroduction into other ecosystems such as the Cabinet/Yaak and the North Cascades Ecosystems, due to the fact there are a limited number of bears available for reintroduction. This alternative would only be implemented if additional funds become available above and beyond funding for recovery efforts in existing ecosystems (Appendix 24).

There would be no adverse impacts to land-use activities in the BE to include timber harvest and minerals extraction. A recovered population of grizzly bears could depredate 4-8 cattle and 5-44 sheep annually. Prior to recovery, livestock lost to depredation would be minimal. Nuisance bear incidents involving private property could range from 0-74 incidents annually at recovered population levels.

No adverse effects are expected on wildlife populations in the BE. Approximately a maximum of 504 ungulates would be lost annually to a population of 280 grizzly bears. Grizzly bear predation is not expected to result in measurable or observable changes in other wildlife populations in the BE.

Some people would avoid recreating in the recovery area as a result of restoration and grizzly bear presence, because of fear of bears. No adverse effects to hunting seasons are anticipated as a result of grizzly bear recovery.

Adverse effects of this alternative include losses to area ranchers due to livestock predation by grizzly bears may be on the order of $2,700 to $8,600 per year. These livestock losses could, however, be mitigated to a large degree by a private compensation fund.

Short-Term and Long-Term Effects

During the first several decades following reintroduction, the chance of injury caused by grizzly bears would be exceedingly small due to the low density of bears in the area. Based on injury rates in both the NCDE and the YE, it is likely that at recovered bear population levels in the BE, and the increase in human visitation expected in the next 50-110+ years, the chance of human injury once bears are recovered (a minimum of 50 years, and likely more than 110 years after reintroduction) would average less than one injury per year, and less than one bear-induced human mortality every few decades. Several factors under this alternative would further reduce these averages. Proactive monitoring and information and education programs would reduce the risk factors to humans using the recovery and experimental areas. People could kill grizzly bears in self-defense or in defense of others.

Relocation of grizzly bears to the BE is expected to have minimal short-term effects on source populations of grizzly bears. There are no long-term effects anticipated to source populations.

Reintroduction of an experimental population of grizzly bears is expected to have few short-term or long-term effects on land-use in the BE. There are no short-term or long-term effects anticipated for timber harvest and minerals extraction activities. Domestic livestock losses from depredation by a population of 280 grizzly bears are expected to range from 4-8 cattle and 5-44 sheep annually. During the first few decades after reintroduction, bears numbers and depredations are expected to be very low. Losses of livestock are expected to be variable between years and between areas. No long-term effects on overall livestock production in the BE are expected. In the short term, an individual livestock producer could sustain a loss of livestock (most likely sheep) in a given year. Nuisance bear incidents involving private property could range from 0-74 incidents annually at recovered population levels (minimum of 50-110 years after reintroduction). During the first few decades after reintroduction, bears numbers and nuisance bear incidents are expected to be very low. Short-term effects involve loss of private property and inconvenience if nuisance bears have to be trapped and removed. No long-term effects are anticipated.

Establishment of a recovery-level grizzly bear population would have some short-term and long-term effects on ungulate populations in the BE. A population of 280 bears would kill approximately a maximum of 504 ungulates annually. This would represent approximately 0.11% of estimated populations of deer and elk in the PAA. Minimal numbers of moose and black bear could also be killed. No measurable or observable effect is expected on wildlife populations due to grizzly bear predation. As a result of this limited grizzly bear predation, fewer ungulates may die of malnutrition associated with winter stress. Surviving ungulates may benefit very slightly from reduced competition for food and space.

In the short-term, the restoration of grizzly bears into the BE will be controversial and will attract nationwide attention. Initially reintroduced grizzly bears that are collared will be "famous" and people can be expected to venture into the recovery area hoping to see them. In the long-term, the presence of grizzly bears in the BE will continue to attract some people to Idaho and to the backcountry who would otherwise not visit. The presence of grizzly bears in the BE will also preclude some people from visiting the central Idaho backcountry because of fear of this species. The majority of recreationists and resource area users would continue to use the recovery area with little change in their trip frequency or length. Short-term impacts could include increased sanitation requirements for backcountry users, but these impacts would diminish in the long-term as recreationists became familiar with and equipped for backcountry use in grizzly bear country. In the long-term, recreation and visitor use of the BE would continue to increase. There should be no significant short-term or long-term effects to hunting seasons or hunter opportunity. Any restrictions on black bear hunters or other hunting opportunities to reduce the likelihood of mistaken identity kills or to address other potential conflicts could be recommended by the CMC, but would have to be acceptable and implemented by the IDFG and MDFWP. In the long-term, there could be a positive impact to hunter opportunity if the decision is made to hunt grizzly bears.

In the short-term there will be management costs on the order of 433,632 dollars per year during the 5 year recovery period and 193 thousand dollars per year for each year beyond the reintroduction period. Losses to livestock are likely to be less than predicted in the short-term and rise to the predicted level in the long-term (after full recovery). The total estimated benefits per year apply to both the short-term and the long-term.

The long-term presence of grizzly bears would represent a significant restoration of a missing component of the ecological system. The recovery of grizzly bears in the BE will allow the return of the only native omnivore now missing from this large block of Rocky Mountain wilderness habitat. A slight long-term increase of visitor use is projected because people would want to have the opportunity to see grizzly bears or see their sign in a wild setting. The reestablishment of this prominent native omnivore will have significant positive long-term effects on ecological relationships and ecosystem functions. A population of grizzly bears and their interaction with other biotic components would add to the long-term stability of the natural biological and evolutionary processes in the BE, as well as increase the chance of long-term survival of grizzly bears in the lower 48 states.

Irreversible and Irretrievable Commitments of Resources

The reintroduction of an experimental population of grizzly bears into the BE could lead to increased risk to human health and safety for people in the BE. The chance of human injury once bears are recovered (a minimum of 50-110 years after reintroduction) would average less than one injury per year, and less than one bear-induced human mortality every few decades.

The reintroduction of an experimental population of grizzly bears into the BE is expected to lead to the loss of about 4-8 cattle and 5-44 sheep annually, after population recovery in a minimum of 50 and likely more than 110 years. Minimal livestock losses are expected before the population reaches recovery levels. Any livestock losses will be irreversible and irretrievable. Any compensation paid by private groups to livestock operators will reduce the monetary loss. Private property may be damaged or lost during nuisance bear incidents that are estimated to range between 0-74 incidents annually at recovered grizzly bear population levels. Some private property loss would be irreversible and irretrievable. There are no irreversible or irretrievable commitments of other land-uses (to include timber harvest and minerals extraction) expected in the BE.

The reintroduction of an experimental population of grizzly bears into the BE is not expected to lead to any irreversible or irretrievable commitments of the health of source populations of grizzly bears. There are no anticipated irreversible or irretrievable commitments of wildlife resources or hunting opportunity in the BE. There are no anticipated irreversible or irretrievable commitments of public access or recreational use in the BE.

From an economic and social perspective, the only irreversible and irretrievable commitments of resources lie with the grizzly bear management costs and the livestock losses as they occur. The program could at any time be modified to mitigate or eliminate these losses.

Cumulative Effects Analysis

Human Health and Safety.—The reintroduction of grizzly bears into the BE would potentially allow for interactions between grizzly bears and humans. Due to the slow reproductive capacity of grizzly bears, the first few decades following the reintroduction would result in low bear densities scattered throughout the ecosystem, and subsequently low human-bear conflicts. Based on a 2-4% growth rate, it would take 40 - 80 years for grizzly bears to reach 150 in number and likely more than 110 years to recovery of 280 bears. Injury and fatalities caused by grizzly bears would likely remain very low or non-existent during the first few decades, and increase as grizzly bear numbers and human numbers increase in the same area. Based on what is currently occurring in the NCDE and the YE, there could be as many as 1 injury per year and up to 1 mortality every few decades as a result of grizzly bear-human conflicts.

Current fatalities occurring on the national forest lands in Clearwater and Idaho counties average about 10 per year. Vehicle accidents and drowning are currently the two most common methods of human fatality within the national forest boundaries in these counties. The portion of the PAA most likely to be inhabited by grizzly bears within the first few decades following reintroduction is located mostly within these two counties in Idaho. Therefore, the addition of 1 fatality every 10-20 years following grizzly bear recovery would represent only a small fraction (<1%) of total fatalities occurring annually on national forest lands within the PAA. Human fatalities fluctuate annually but have been increasing slightly over time within the PAA. Although any human fatality is serious, grizzly bear-inflicted fatalities would not likely measurably increase current death rates within the PAA.

Source Populations of Grizzly Bears.—The reintroduction of grizzly bears into the BE would require capture and relocation of a minimum of 25 bears over a period of 5 years from the identified source populations in Canada and the U.S. An equal contribution of bear numbers would be made from Canada and the U. S. These relocated bears would be lost from these populations and this loss would be a man-caused loss similar to a mortality. Some of the losses would be compensatory due to young bears having high natural mortality rates. Losses of bears from populations through human-caused actions are regulated and limited to assure the health of these populations. Mortality limits are in effect in both the NCDE and YE (USFWS 1993). These mortality limits are currently set based on a formula that allows no more than 4% human-caused mortality of the minimum population estimate based on a running 6-year average. Of this 4% limit, no more than 30% can be females. Only grizzly bear mortalities that occur within designated recovery zones or within a 10-mile buffer area around the recovery zone boundary are used in the calculation to determine if a population has exceeded mortality limits established by the Recovery Plan. Thus, bears removed from areas more than 10 miles outside recovery zone boundaries in the NCDE and YE would not be counted as mortalities.

A recent report by Simpson et al. (1995) analyzes the grizzly bear status and management approach for the Kootenay region. Average annual harvests in the Kootenay Region for the past 19 years (1976-1994) in the 15 GBMUs varies by unit and totals 55.7 bears/year for an average harvest rate

of 2.56%/year. The management objective recommended in the Simpson et al. (1995) report is a 4% human-caused kill limit of male grizzly bears and a 2% female limit. In British Columbia, grizzly bear mortality is managed (B.C. Min. Environ., Lands, and Parks 1995) so that the maximum harvest throughout the province will be no more than 4% of the total population (including kills from all sources), and the maximum sex ratio of the harvest should be no greater than 1 female to 2 males (33% females).

There would be no cumulative effects to the health of source populations because mortality limits in the Grizzly Bear Recovery Plan (USFWS 1993) and British Columbia grizzly bear management criteria (B.C. Min. Environ., Lands, and Parks 1995) would be adhered to during implementation of this alternative. Since these data are updated each year, it is necessary to recalculate mortality levels for the NCDE and YE prior to making a decision on the origin of any relocated bears. The specific number of grizzly bears that could be obtained from the NCDE and/or YE is unknown at this time. The female contribution would be designed to minimize impacts on source populations, and the male contribution could be a higher number because population increase is affected little by removal of subadult males (USFWS 1993, Eberhardt et al. 1994). No female grizzly bears would be removed from within the recovery zone or from within 10 miles outside the NCDE or YE recovery zone boundary in the NCDE or YE.

If, for example, the total reintroduction of a minimum of 25 bears (estimated 5 bears per year for 5 years) is implemented and the NCDE and/or YE contribute 1 male and one female/year, this would require that 3 bears/year come from British Columbia's Kootenay Region. If the long-term harvest average in the Kootenay Region is 55.7 bears/year as it has been in the past, then 3 additional bears removed for reintroduction into the BE would result in an increase in the harvest in the Kootenay Region to 58.7 bears/year for 5 years. This would result in an increase in the average harvest rate from 2.56%/year to 2.70%/year for the next 5 years. This appears to be within the management objectives of the British Columbia Ministry of Environment, Lands, and Parks, however meeting these objectives is dependent upon which of the 15 GBMUs provide the bears for reintroduction. If it is not acceptable to add the removal of 3 bears/year to the existing harvest level, then there could be a reduction in existing harvest in those GBMUs where the 3 bears would be removed.

Land-Use Activities.—Total livestock mortality each year attributed to weather, health, poison, theft, and other non predator related mortality accounts for the majority of livestock losses in Idaho (USFWS 1993). Total livestock losses for Idaho were 72,000 cattle and calves and 50,000 sheep and lambs. Livestock mortality related to predators is 1.8% of annual cattle losses and 31.2% of annual sheep losses. The addition of 4-8 cattle or calf losses and 5-44 sheep or lamb losses estimated from a recovered grizzly bear population of 280 would represent 0.006-0.01% of existing statewide annual cattle losses and 0.0-0.09% of statewide annual sheep losses. Because livestock are concentrated in the southern end of the recovery area, losses attributed to grizzly bears are not expected for a few decades, unless bears move to private land outside the recovery area. Although this could occur, effective bear and livestock management would likely reduce or eliminate such activity from occurring regularly.

Private property may be damaged or lost during nuisance bear incidents that are estimated to range between 0-74 incidents annually at recovered grizzly bear population levels. These include incidents where bears obtain anthropogenic foods (e.g. garbage), damage property, damage bee hives, and obtain fruits and vegetables from orchards and gardens. However, by the time bears would be recovered in the BE, much more certainly would be known about proper sanitation and avoiding many of the potential conflicts between bears and man, and therefore, conflicts should be greatly reduced. Other nuisance wildlife incidents occur within the PAA to include property damage, black bears obtaining anthropogenic foods, and depredations in agricultural fields, orchards, and gardens. The grizzly bear nuisance incidents would add cumulatively to these existing incidents.

Wildlife Populations.—A recovered population of grizzly bears in the experimental area is predicted to kill approximately a maximum of 504 ungulates per year. Predation will occur predominantly on elk, moose, and deer. Bear predation is not expected to result in measurable or observable changes in populations of ungulates, and no changes in big game management would be necessary. Bears will kill some healthy ungulates, but most of the prey killed by bears will be very young, very old, sick or injured.

Wolves were reintroduced into the central Idaho area in 1995 and again in 1996. Once wolves are recovered (100 wolves) they are expected to kill approximately 1,650 ungulates per year (495 elk, 1,155 deer, and a few moose and bighorn sheep) (USFWS 1994) or approximately 0.35% of the PAA's total pre-hunting season ungulate population. Grizzly bears at recovered levels would kill approximately 0.11% of the PAA's total pre-hunting season ungulate population. The combined predation of these two reintroduced species amounts to approximately 0.46% of central Idaho's total ungulate population. Grizzly bears would account for approximately 0.3% of the total annual non-hunter related ungulate mortality in the PAA. Even if all of the predation were additive and not compensatory, 3 tenths of a percent will not impact big game populations even with the addition of the wolves. The USFWS (1994) found that some adjustments in the cow harvest may be necessary to compensate for wolf recovery in the central Idaho area based on their computer modeling. The model assumed that all wolf predation was additive, and used ungulate data that have since been updated, thus leading to improbable but possible conclusions. Obviously some of the animals preyed upon by wolves would have died from some other cause. In addition, since the 1994 analyses, the ungulate population has increased, and more data have become available. The cumulative impacts of 280 grizzly bears would account for an additional 30% more predation than would 100 wolves. However, the combined predation of these two species is approximately 0.46% of the total ungulate population in central Idaho and based on the area of expected impact by grizzly bears, the overall ungulate population would likely reflect no measurable change.

Mountain lion predation will probably always constitute the majority of predation in the PAA. Adult lions kill 1 ungulate every 7-10 days (Murphy pers. comm. 1996). Lion harvest in 1995 in the PAA was 232 lions, 190 of which were adults. The annual predation attributed to that many lions would have been between 6,935 and 9,880 ungulates for that year. Because lions are such efficient predators and are numerous enough to provide an annual harvest of over 200 in the PAA, their

overall but unknown impact on ungulate populations may influence the rate of growth of ungulate populations. However, the addition of 504 ungulates that would be predated upon by grizzly bears would be only 6% of the predation attributed to those lions that are harvested annually in the PAA. Annual fluctuation of only 20 lions harvested would negate any predation by grizzly bears. The known predation rates of 20 adult lions would equate to known predation rates of a population of 280 grizzly bears.

In a study area on the North Fork of the Flathead River drainage in northwestern Montana and southeastern British Columbia adjacent to Glacier National Park, bears exist in a multi-predator-prey ecosystem. In this study, wolves killed an estimated 4.1% of female elk (Bureau 1992) and 6.7% of female white-tailed deer annually (Rachael 1992). Mountain lions annually killed 13.4% of female elk and 4.9% of female white-tailed deer (Bureau 1992, Rachael 1992). Bears (both black and grizzly bears) were important predators in that study area, and bears killed an estimated 1.5% of female elk (Bureau 1992) and 3.4% of female white-tailed deer annually (Rachael 1992).

Mountain lions and black bears are also common predators throughout the PAA, and would continue to prey on ungulates in central Idaho in the presence of wolves and grizzly bears. Wolf and grizzly bear densities would be considerably lower in the PAA at recovered levels than they currently are in Flathead study area. Predator interactions are being studied throughout North America. How predators impact each other and their prey is currently not very well understood, but all predation is clearly not additive, and some predator interactions will negate other predator impacts. Individual black bear predation is probably less than individual grizzly bear predation, but cumulative black bear predation would be much greater than grizzly bear predation due to overall population sizes. Additionally, grizzly bears may occasionally kill black bears, lions, coyotes, and wolves, and may also scavenge carcasses from these other predators. Coyotes are known to prey upon calves and fawns. However, following reintroduction in the YE, wolves were documented killing many coyotes and have started to replace them as the primary canid predator (DiSilvestro 1996). Because of predator interactions such as these, cumulative impacts cannot be totally additive. We know that grizzly bears will prey on some ungulates. But because of the overall interactions and yearly variations in predator densities, as well as annual variation in ungulate densities due to weather, the recovery of 280 grizzly bears over a 50-110+ year period would not measurably impact ungulate populations in the PAA.

An Intra-service Section 7 evaluation of the impacts of grizzly bear restoration in the BE on other resident listed wildlife and fish species was conducted by the USFWS. The resultant Biological Assessment (BA) and letter of concurrence are included in FEIS Appendix 9A. The BA indicates the proposed action would benefit the grizzly bear; would not likely adversely affect gray wolves, bull trout, and lynx; and would have no effect on the other wildlife and fish species analyzed. Impacts to listed anadromous fish species from grizzly bear recovery in the BE were analyzed in a Biological Assessment prepared by the USFWS and reviewed by the National Marine Fisheries Service (NMFS). The results of the Section 7 consultation between USFWS and NMFS are documented in a Biological Opinion prepared by NMFS which is included in FEIS Appendix 9B.

NMFS determined that grizzly bear recovery in the BE would not likely jeopardize the continued existence of Snake River steelhead, sockeye salmon, and spring/summer chinook salmon species or result in destruction or adverse modification of critical habitat.

Public Access and Recreational Use.—Current use of the PAA measured in RVD's (Recreational Visitor Days) was 13,268,395 in 1995. There is no information available as to the breakdown of the percent of local, regional and national outdoor recreationists in the PAA. Therefore, there is no real way to determine the change if any expected in the annual RVD's following reintroduction. Some people will avoid the PAA, and some will be attracted to the PAA because of bears. However, what is not known is what impacts an increase of 1% national visitation would have on the PAA. Annual RVD's increased about 7% in central Idaho between 1993 and 1995, and will continue to increase as the demand for wilderness and outdoor recreation areas increases nationally. Consequently, despite some possible temporary changes in visitation rates (up or down) as a result of reintroduction, little overall change in increasing visitation rates would be expected over time. Visitation will continue to increase as a result of expanding population pressures and the subsequent increased demand for outdoor recreation opportunities. Also, there is no way of predicting the number of people who will continue to recreate despite an initial avoidance of the PAA, once they feel comfortable that the benefits outweigh the small risks involved.

Nature study, hiking, walking, and camping and off-highway vehicle use activities in Idaho are all projected to experience moderate to high growth to the year 2010. Hunting activities in Idaho are projected to experience low growth to the year 2010 (IDPR 1989). The expected impacts to backcountry user groups such as outfitters and rafters could include increased requirements to store food so it would be unavailable to grizzly bears, and to keep clean camps so as not to attract bears. This would enhance human safety and minimize human impacts on a wide range of wilderness resources including other wildlife species and water quality. Appendix 22 provides a preliminary report on sanitation improvements needed throughout the BE for all wildlife species, and could apply to grizzly bear recovery efforts.

Tourism and outdoor recreation are growing in Idaho. Grizzly bears are a high profile species with interest and support nationwide. Restoration of grizzly bears under Alternative 1 will further increase national awareness of the presence of this species in central Idaho. It is likely that the recovery of grizzly bears will attract increased visitors to the BE in the next decade and beyond. Although some people will not venture into the Idaho backcountry because of fear of grizzly bears, others will visit central Idaho hoping to see bears or their sign.

Economics and the Social Environment.—Alternative 1 for grizzly bear management in the BE would result in an estimated $40.4 to $60.6 million dollars in benefits per year and direct costs of 436 to 442 thousand dollars per year for the first five years. The largest component of total costs would be the grizzly bear management costs of 433,632 dollars per year during the first 5 years of the recovery program. After the first 5 years when reintroductions are complete, the total cost would decrease to 196 to 202 thousand dollars per year. Implementation of this alternative would only occur if additional funds become available above and beyond recovery efforts in existing ecosystems (Appendix 24).

ENVIRONMENTAL CONSEQUENCES ALTERNATIVE 1A. RESTORATION OF GRIZZLY BEARS AS A NONESSENTIAL EXPERIMENTAL POPULATION WITH USFWS MANAGEMENT

Impacts on Human Health and Safety

Impacts on human health and safety from implementation of this alternative would be similar to those described for Alternative 1. The BE grizzly bear population would be managed by the USFWS as a nonessential experimental population under this alternative.

Conclusions.— During the first several decades following reintroduction, chance of injury caused by grizzly bears would be exceedingly small due to the low density of bears in the area. Under this alternative populations are estimated to achieve recovery levels of approximately 280 bears in a minimum of 50 years, and could likely take more than 110 years. Using human injury rates in the NCDE and YE, and recognizing a net increase in human visitation, projections for human injury, once bears are recovered 50-110+ years in the future, are less than one injury per year and less than one grizzly bear-induced human mortality every few decades.

Impacts on Source Populations of Grizzly Bears

Impacts to source populations under this alternative would be similar to those described for Alternative 1. Reintroduction of grizzly bears into the BE would require capture and relocation of a minimum of 25 bears over a period of 5 years from other areas. Three sources of bears for the BE have been identified: southeast British Columbia, the Northern Continental Divide Ecosystem (NCDE) population in northwest Montana, and the Yellowstone Ecosystem (YE) population. An equal contribution of bear numbers would be made from Canada and the U. S. MDFWP has stated their willingness to use grizzly bears from the NCDE to augment populations elsewhere or reintroduce the species where recovery areas have been identified (Dood and Ihsle Pac 1993, page 107). An attempt was made to transplant a grizzly bear to the Cabinet Mountains from the NCDE in 1992 but trapping efforts to capture a subadult female were not successful (Kasworm et al. 1993). Under ESA Section 10(j), the Secretary of Interior may authorize the release of any population of an endangered or threatened species outside the current range of such species if the Secretary determines that the release will further the conservation of the species, and the population is wholly separate geographically from nonexperimental populations of the same species (See Appendix 12)

Conclusions.—It appears that source areas for reintroduction of grizzly bears into the BE could be both the NCDE and/or YE (based on mortality levels) in Montana and the Kootenay Region in British Columbia, Canada. These areas have habitat similar to the BE and have sufficient numbers of bears to be a source area. Agreement to supply grizzly bears is not an assurance that bears having history of no conflict with humans, and proper age and sex will be available to the BE reintroduction program. The actual capture of the necessary bears is dependent upon access to areas with such bears, and significant effort by capture crews. Capture of desired bears is not assured, even with

intensive effort. It may require more than 5 years to obtain the desired minimum of 25 bears to initiate a new population in the BE. This should be made clear to the public and to cooperating agencies at the outset. There would be no significant detrimental effects to the health of source populations because mortality limits in the Grizzly Bear Recovery Plan (USFWS 1993) and British Columbia grizzly bear management criteria (B.C. Min. Environ., Lands, and Parks 1995) would be met during implementation of this alternative. Further, since no bears would be removed from the YE or NCDE if the mortality limits would be exceeded, and no female bears would be removed from within the recovery zone or within 10 miles of the recovery zone boundary of either ecosystem, then the effects on recovery of any removals of bears from the NCDE or YE would be nonexistent.

Impacts on Land-Use Activities

Impacts on land-use activities from implementation of this alternative would be similar to those described for Alternative 1, except that USFWS would manage the BE nonessential experimental population and would review land-use activities and make recommendations to land and game management agencies. This alternative includes the reintroduction of a population of grizzly bears to be designated "experimental" and "nonessential" (refers to an experimental population whose loss would not likely reduce the survival of the species in the wild) under the ESA amendment 10(j). Federal agencies would only have to confer with the USFWS on activities that are likely to jeopardize the species. Grizzly bear management under this alternative would allow for resource extraction activities to continue without compliance with Section 7 consultation or Section 9 “takings” provisions under the ESA. No constraints on private land management actions and private lands are included in Alternative 1A.

Alternative 1A indicates that the USFWS would review any potential impacts to land uses and assure that resource extraction activities would be maintained in the BE. Alternative 1A also indicates that existing USDA Forest Service (USFS) Forest Plan standards and guidelines, as amended, would be deemed adequate pending review by the USFWS. The USFWS would be responsible for recommending changes in land-use standards and guidelines in the BE, as necessary, for grizzly bear management to land and game management agencies. It is anticipated that laws and regulations in the BE, in effect at the time of issuance of this FEIS, and governing land management activities would promote grizzly bear recovery.

Impacts on Timber Harvest.— It is expected that timber harvest is an activity that can be compatible with grizzly bear recovery as long as it meets the existing standards and guidelines of the USFS Forest Plans. Road density guidelines presently in effect in the Clearwater and Nez Perce National Forest Plans outside the wilderness areas are assumed to be adequate for grizzly bear recovery (see Appendix 10). If this alternative is implemented, the Special Rule would allow the USFWS to make recommendations for changes to land and game management agency management plans. The final decision on implementation of those recommendations would be made by those agencies, and the requirements of NEPA could apply.

Impacts on Minerals Extraction.—Mineral extraction would likely not be altered due to grizzly bear concerns in and by themselves. Recommendations would be made by the USFWS to reduce potential impacts if the need arises.

Impacts on Domestic Livestock.—Within the experimental area boundaries, grazing occurs predominantly in the southern portion of the BE (Figure 3-8, Table 3-13). Consequently, at recovered grizzly population levels and current livestock stocking rates, impacts to livestock would be expected to be similar to levels occurring in portions of the NCDE and the YE. In 50-110+ years (the estimated time to recovery assuming 2-4% growth rates) grizzly bears would likely be present within the southern portion of the BE. Projections indicate that at a grizzly bear population level of 280 bears in the recovery area, yearly livestock losses to depredation by bears could range from 4-8 cattle and 5-44 sheep. Management activities would try to preempt livestock problems. The USWFS would try to make all uses compatible with recovery.

Impacts on Other Private Property.—Based on what is currently known about bear behavior in these other ecosystems, once bears are recovered in the BE, bear incidents would likely range between 0 and 74 per year. However, by the time bears would be recovered in the BE, conflicts should be greatly reduced because much more would be known about proper sanitation and avoiding many of the potential conflicts between bears and man.

Conclusions.—Livestock grazing, although presently either not occurring or at very low densities within the recovery area, is not expected to be impacted. However, within the experimental boundaries, grazing occurs predominantly in the southern portion of the BE (Figure 3-8, Table 3-13). Consequently, at recovered grizzly population levels and current livestock stocking rates, impacts to livestock would be expected to be similar to levels occurring in portions of the NCDE and the YE. In 50-110+ years (the estimated time to recovery assuming a 2-4% growth rate) grizzly bears would likely be present within the southern portion of the BE. Projections indicate that at a grizzly bear population level of 280 bears in the recovery area, yearly livestock losses to depredation by bears could range from 4-8 cattle and 5-44 sheep. Management activities would try to preempt livestock problems. The USFWS would try to make all uses compatible with recovery.

Restoration of a nonessential experimental population of grizzly bears into the BE is not expected to impact existing land uses in the BE, including timber harvest and minerals extraction activities. Based on what is currently known about bear behavior in the NCDE and YE, once bears are recovered in the BE (a minimum of 50 years, and likely more than 110 years after reintroduction), nuisance bear incidents would likely range between 0 and 74 per year. However, by the time bears would be recovered in the BE, conflicts should be greatly reduced because much more would be known about proper sanitation and avoiding many of the potential conflicts between bears and humans.

Impacts on Wildlife Populations

Impacts on wildlife populations from implementation of this alternative would be similar to those described for Alternative 1.

Conclusions.—In many locations, animal matter may not constitute a major annual diet item, but may be seasonally vital to bears (Mattson et al. 1991). An expected predation rate of 0.17-0.38% of the ungulate populations in the area occupied by bears in the BE could occur. Using Mattson's (1997) estimate of 1.4 or 5.8 ungulates per year for adult female and male bears respectively, a population of 280 bears (USFWS 1996) would be expected to prey upon a maximum of 504 ungulates per year across the BE. The loss of 504 ungulates to a recovered grizzly bear population would represent approximately 0.11% of estimated pre-harvest populations of ungulates in the PAA. Potential long-term impacts to black bear population dynamics is unclear, but felt to be minimal. Overall impacts of a recovered population of grizzly bears on other wildlife populations are expected to be minimal. It should not be necessary to adjust hunting seasons to compensate for grizzly bear predation on other wildlife. Any restrictions on black bear hunters or other hunting opportunities to reduce the likelihood of mistaken identity kills or to address other potential conflicts could be recommended by the CMC, but would have to be acceptable and implemented by the IDFG and MDFWP. Grizzly bears will kill some healthy ungulates, but a large percentage of prey killed by bears will be very young, very old, sick, injured, or otherwise disadvantaged. Consequently, fewer ungulates will die from malnutrition associated with winter stress. To a small extent, competition among ungulates for food and space will be reduced, and the health of surviving ungulates may be increased an undetermined, but probably minimal amount. Grizzly bear recovery in the BE would not significantly impact other listed wildlife or fish species (Appendices 9A and 9B).

Impacts on Public Access and Recreational Use

Impacts on wildlife populations from implementation of this alternative would be similar to those described for Alternative 1.

Visitor use.—Despite some possible temporary changes in visitation rates (up or down) as a result of restoration, little overall change in increasing visitation rates would be expected over time. Visitation will continue to increase as a result of expanding population pressures and the subsequent increased demand for outdoor recreation opportunities. Also, there is no way of predicting the number of people who will continue to recreate despite an initial avoidance of the PAA, once they feel comfortable that the benefits outweigh the minimal risks involved. Nature study, hiking, walking, camping, and off-highway vehicle use activities in Idaho are all projected to experience moderate to high growth to the year 2010. Hunting activities in Idaho are projected to experience slow growth to the year 2010 (IDPR 1989). The expected impacts to backcountry user groups such as outfitters and rafters could include increased requirements to store food so it would be unavailable to grizzly bears, and to keep clean camps so as not to attract bears. This would enhance human safety and minimize human impacts on a wide range of wilderness resources including other wildlife

species and water quality. Appendix 22 provides a preliminary report on sanitation improvements needed throughout the BE for all wildlife species, and could apply to grizzly bear recovery efforts.

Trail and Road Closures.—No trail or road closures are expected solely for grizzly bears at this time. In the NCDE where a minimum population of about 325 grizzly bears currently exist, only one trail was closed on national forest lands because of grizzly bears in the last 10 years (USFS, Unpubl. data 1996). This closure was a result of concerns for human safety when a bear was seen feeding on an elk carcass on a trail. During the peak of the visitor use season in Glacier National Park, fewer than 5% of the trails are closed at any time as a result of safety concerns. Because of the difference between national park and national forest management, closures in the BE would most likely be extremely rare and probably be similar to the NCDE, and be based on USFWS recommendations for human safety.

Hunting seasons.—Under this alternative, there are no proposed changes in hunting seasons. It is predicted that 280 grizzly bears would kill a maximum of 504 ungulates per year. Interactions with other predators and the compensatory nature of some predation may affect the total loss of ungulates to predators, but at this rate only 0.11% of the pre-harvest ungulate population would be preyed upon by a recovered bear population. It should not be necessary to adjust hunting seasons to compensate for grizzly bear predation on other wildlife. Any restrictions on black bear hunters or other hunting opportunities to reduce the likelihood of mistaken identity kills or to address other potential conflicts could be recommended by the USFWS, but would have to be acceptable and implemented by the IDFG and MDFWP.

Conclusions.—Under this alternative, the USFWS would recommend changes to current management practices with the least impacts to resource use industries, including recreational industries, while prioritizing grizzly bear recovery. Although some people would avoid recreating in the recovery area as a result of restoration, other people would increase their recreation in the area because of it. The vast majority of recreationists and resource area users would continue to use the recovery area with little change in their trip frequency or length. Over time, recreation and visitor use of the PAA would continue to increase. No changes in hunting seasons are currently anticipated as a result of grizzly bear recovery, although changes could be recommended by the USFWS to state agencies to address potential conflicts.

Impacts on Economics and the Social Environment

Impacts to Economics and the Social Environment would be similar to those described for Alternative 1. However, the costs associated with Alternative 1A would be $20,000 less per year than Alternative 1 because there would be no costs associated with the CMC.

Background Information for Analysis.—An economic analysis of the effects of grizzly restoration into the Bitterroot Ecosystem necessarily entails examining each potential source of economic costs or benefits and estimating its net economic effect. The areas of potential economic effects examined

are the following: (1) effects on hunter harvest, (2) effects on livestock depredation, (3) effects on land use restrictions, (4) effects on visitor use, and (5) effects on existence values.

Impact on the Economic Value Associated with Hunter Harvest.—One of the potential effects of grizzly restoration to the Bitterroot Ecosystem is on big game hunting opportunities in hunting units/districts in or near the recovery area. As discussed previously in the section on the effect of restoration on wildlife populations, grizzly bear recovery is not expected to have any significant effect on huntable populations of ungulates in the BE. It is not expected that restrictions on black bear hunting in wilderness areas would occur under this alternative. However, hunters could suffer an economic loss associated with grizzly recovery if future restrictions on black bear hunting in the recovery area result in a decrease in total days spent hunting black bears in the region (see Alternative 4 analysis, this Chapter).

Economic Impact on Domestic Livestock.—A second area of potential costs associated with grizzly restoration to the BE is the possibility of livestock depredation by the recovered grizzly population. The calculation of lost value due to this depredation is straightforward. The lost value per year is equal to the estimated number of lost animals per year times the market value of those animals. For a discussion of how the estimates of livestock depredation in the Bitterroot Ecosystem were computed, see Chapter 4, Alternative 1, Impacts on Domestic Livestock.

Grizzly depredation on domestic livestock would likely be minimal during the estimated 50-110+ years until the population of grizzly bears in the BE is fully recovered. It is estimated that after a recovered population of 280 grizzly bears is achieved, depredation incidents involving livestock would be between 4 and 8 cattle and between 5 and 44 sheep per year. Prior to full recovery depredation losses are expected to be below these estimated levels. Table 4-4 shows the estimated losses due to predation on livestock under Alternative 1 and this also applies to Alternative 1A. It is estimated that between $2,720 and $8,568 dollars per year in livestock predation losses would occur if grizzly bears were reintroduced to the BE under Alternative 1A.

Economic Effect of Land Use Restrictions on Recreation.—It is expected that any land use restrictions due to the restoration of grizzly bears to the BE would not result in lost economic value. While some area visitors may be inconvenienced due to occasional temporary trail closures, this inconvenience is unlikely to result in any appreciable loss of economic value. Therefore, for all proposed alternatives the net economic cost due to land use restrictions on recreation is estimated to be zero.

One aspect of restrictions on recreation which would have distributional effects within the economy concerns the potential imposition of regulations requiring outfitters operating within the recovery area to use bear-proof garbage and food containers and methods when in the backcountry. The purchase of bear-proof containers or hoists would impose an additional expense on the outfitters operating within the recovery area. These costs would represent transfers of income between the outfitters and those individuals or firms producing and selling the bear-proof products.

Economic Effect of Land Use Restrictions on Timber Harvest.—Timber harvest is an activity that can be compatible with grizzly bear recovery as long as it meets the standards and guidelines of the USFS Forest Plans. Current USFS Forest Plans for the Clearwater and Nez Perce National Forests outside of wilderness areas are adequate for grizzly bear recovery (see Appendix 10). Therefore, under Alternative 1A it is not anticipated that grizzly bear recovery in the BE would have an economic effect on current timber harvest plans.

Economic Effect of Land Use Restrictions on Mineral Extraction.—Mineral extraction would not likely be altered due to grizzly bear concerns in and by themselves. Therefore, under Alternative 1A it is not anticipated that grizzly bear recovery in the BE would have any economic effect on mineral extraction in the area.

Economic Effect of Changes in Visitor Use.—Grizzly bears are a high profile species with interest nationwide. A survey of Yellowstone National Park visitors found that respondents ranked the grizzly bear highest among wildlife species they would most like to see on their trip to the park (Duffield 1992). Restoration of grizzly bears under Alternative 1A would further increase national awareness of the presence of this species in the lower 48 states. While some individuals might wish to see a grizzly bear in the wild, others might wish to avoid the possibility of encountering one of these large mammals. Possible effects of this increased awareness might be increased or decreased visitation to the recovery area. It appears that changes in visitation resulting from grizzly bear restoration would be minimal under this alternative. Based on survey responses, no significant increase or decrease in visitation to the BE resulting from restoration is anticipated.

Economic Effect on the Value Potential Visitors Place on Grizzly Bears.—A final area of potential change in economic value associated with grizzly bear restoration to the BE is the value potential visitors and others place on having a recovered grizzly population in the area. There are two components to this value. There is value associated with seeing grizzly bears in the wild. There is also what is called "passive use value" or "existence value". Existence value is the value a person associates with the knowledge that a resource exists, even if that person has no plans or expectations of ever directly using that resource (Krutilla 1967).

Table 4-6 (Alternative 1 section) shows the calculation of the total net economic existence value per year of grizzly bear reintroduction to the BE. The information in this table also applies to Alternative 1A. We do not know the exact relationship between stated and actual willingness to contribute for grizzly bear recovery in the BE. Even adjusted for an assumed difference between stated and actual willingness to contribute, the estimated existence value benefits of grizzly bear recovery in the BE is very large, on the order of $50 million per year. This large estimate reflects the large percentage of the U.S. population that supports the recovery effort and the fact that the grizzly bear is an extremely high profile wildlife species.

It must be noted that the willingness to pay estimates in Table 4-8 are based on the assumption that the recovery plan detailed under Alternative 1A would result in a recovered grizzly bear population

in the BE. If the reintroduction plan in Alternative 1A were to fail, the benefits detailed in Table 4-8 would not be realized.

Table 4-8. Annual net social benefits associated with grizzly bear recovery in the BE under Alternative 1A.

Category of Benefit / Loss	Type of Impact (Market / Non-Market)	Impacted Population / Area	Annual Impact (1996 dollars)	
			Low Estimate[a]	High Estimate[a]
(A) Benefits Associated With Grizzly Bear Recovery				
Annual net economic value of recovery	non-market	United States population	40,449,030	60,639,180
(B) Costs Associated With Grizzly Bear Recovery				
Value of hunting losses	market and non-market	hunters and local businesses	0	0
Value of livestock losses	market	ranchers[b]	2,720	8,568
Annual grizzly bear management cost during first 5 years of program[c]	market	United States taxpayers	413,632	413,632
Total costs	---	---	416,352	422,200

[a] For the benefits estimates, the low and high estimates represent a 95% confidence interval on the estimates of net willingness pay for the alternative. For the individual costs, the low and high estimates represent the best estimates of minimum and maximum costs associated with an alternative. The final net benefits figures do not represent a confidence interval but rather a plausible range of benefits associated with the alternative.

[b] If a compensation program for grizzly depredation existed, the impacted population would be the contributors to the fund.

[c] See FEIS Appendix 7 for itemized costs. After the first five years it is estimated that the Alternative 1A recovery program would cost $173,000 per year for monitoring and management.

Conclusion.—It is estimated that grizzly bear recovery in the BE under Alternative 1A will lead to total benefits of approximately 40.4 to 60.6 million dollars per year and total costs of 416 to 422 thousand dollars per year for the first five years. The largest component of total costs would be the grizzly bear management costs of 413,632 dollars per year during the first 5 years of the recovery program. After the first 5 years when reintroductions are complete, the total cost would decrease to 176 to 182 thousand dollars per year.

Social Impacts

The potential social impacts from the implementation of this alternative are varied and difficult to assess. Appendix 19 contains a summary of the public comments received during the scoping process for this DEIS. This appendix provides samples of actual comments regarding views and anticipated impacts of recovering grizzlies in the BE. As such, the appendix provides an indication of potential social impacts.

In summary, impacts would be felt at various scales within society to include local, regional, and national levels. Most impacts would however occur at the local level within communities surrounding the BE. These could include impacts to lifestyles and livelihoods of local residents caused by inconveniences and damage from nuisance bear incidents (previously described in the section "Impacts to Other Private Property"). Backcountry users and outfitters could be impacted by new sanitation requirements and techniques necessary for camping and hunting in grizzly bear habitat (described under "Impacts on Public Access and Recreational Use", and "Economic Effect of Land-Use Restrictions on Recreation"). Survey results (Duda and Young 1995) indicate that some people would avoid the BE if grizzlies were present, and others would be attracted to the area given the prospect of seeing a grizzly bear. Some individuals would wish to never see a grizzly bear in the wild, and others would feel their experience was greatly enhanced by the encounter. For additional information on potential social impacts to local communities (with emphasis on Ravalli County, Montana) see the document, "Sociocultural Context for the Reintroduction of Grizzly Bears to the Bitterroot Ecosystem (in the DEIS Administrative Record).

Social impacts could result from potential changes to land-use activities ("Impacts on Land-Use Activities" section), although none are proposed under this alternative. Local and regional communities could benefit economically and culturally from tourism resulting from grizzly restoration, and this could manifest itself in social changes. Some people would experience fear from grizzly bear presence, and others would find joy in knowing grizzlies were restored to the wilds of Idaho and Montana. Traditional hunting culture would benefit from the prospect of hunting grizzly bears once the population was recovered and delisted. The Nez Perce Indians would experience a net positive impact from the return of the grizzly bear which is a powerful spiritual symbol within their culture.

Appendix 18, "Expected Timelines to Commence Implementation of the Preferred Alternative and Initial Implementation-Associated Sanitation Efforts to Minimize Conflicts", discusses the USFWS vision for implementation of this alternative. The first year of implementation would be a "phase-in" year where sanitation equipment would be installed in key areas, and information and education outreach programs would be initiated. Appendix 22 lists areas in the BE needing sanitation improvements. This would help to minimize conflicts between bears and people, and would also lessen the potential social impacts.

ENVIRONMENTAL CONSEQUENCES ALTERNATIVE 2. NO ACTION ALTERNATIVE — NATURAL RECOVERY

Impacts on Human Health and Safety

Under this alternative, there is only a remote likelihood that recovery of grizzly bears in the BE would occur through natural recolonization because grizzly bears do not readily colonize distant, disjunct areas such as the BE. There are two other recovery areas that are occupied by recovering populations of grizzly bears that might serve as sources of bears to naturally recolonize the BE through expansion of their current ranges. These ecosystems include the Selkirk, (SE), Cabinet/Yaak (CYE), and Northern Continental Divide (NCDE) ecosystems (Figure 2-5). The likelihood of grizzly bear recolonization of the BE would be dependent upon several factors including; population levels and pressures within the CYE and NCDE, impediments to movement south of the CYE and NCDE, and survival prospects of bears inhabiting the area between the CYE, NCDE, and the BE. Population levels in the Cabinet Mountains portion of the CYE were estimated to be 15 or fewer grizzly bears (Kasworm and Manley 1988). Under expected conditions, it could take at least 50 years for reproducing populations of bears from the CYE to expand to the Selway-Bitterroot Wilderness, which is 80 miles away. Once reproducing populations of grizzly bears reached the BE, it would conservatively require an additional 50-110 years to reach the recovered level of 280 bears (see Figure 2-3). Thus the estimated time to recover grizzly bears in the BE under this alternative is at least 100-160 years.

Therefore, this alternative would not cause any risk to human safety until it was determined that grizzly bears were actually moving from other occupied ecosystems and expanding their ranges into the BE. If this did occur, there would be an increased risk to human safety commensurate with the number of bears that move over time. The discussion located in Chapter 4 under Alternative 1, "Impacts on Human Health and Safety" would apply if grizzly bears naturally recolonized the BE.

Conclusions.—This alternative would not cause any risk to human health and safety until it was determined that grizzly bears were actually moving from other occupied ecosystems and expanding their ranges into the BE. If this did occur, there would be an increased risk to human safety commensurate with the number of bears that move over time. During the first several decades following establishment of a breeding population of grizzly bears, chance of injury caused by bears would be exceedingly small due to the low density of bears in the area. Under this alternative populations are estimated to achieve recovery levels of approximately 280 bears in 100-160 years. Using human injury rates in the NCDE and YE, and recognizing a net increase in human visitation, projections for human injury, once bears are recovered 100-160 years in the future, are less than one injury per year and less than one grizzly bear-induced human mortality every few decades.

Impacts on Source Populations of Grizzly Bears

This alternative proposes to recover grizzly bears in the BE through natural recolonization. Grizzly bears would not be reintroduced under this alternative.

Conclusions.—There would be no impact to source populations of grizzly bears under this alternative.

Impacts on Land-Use Activities

Because grizzly bears would be fully protected under the ESA, Section 7(a)(2) would apply upon documented evidence of the presence of a grizzly bear(s) in the BE, and all federal actions within the recovery zone would be subject to Section 7 consultation with the USFWS. Also, upon documentation of grizzly bears in the area, the USFWS would evaluate the adequacy of land-use restrictions to protect suitable grizzly bear habitat within the Bitterroot recovery zone. Either one of these activities could restrict land use activities to protect grizzly bear habitat and recovery. To date, there have been few land-use restrictions recommended to protect suitable grizzly bear habitat within the recovery zone for this alternative. This could change if grizzly bears are documented in the BE, which would trigger Section 7 consultation requirements under the ESA.

Impacts on Timber Harvest.—It is expected that timber harvest is an activity that can be compatible with grizzly bear recovery, however all sale activities would be subject to Section 7 consultation if grizzly bears were present in the BE, and could be affected based on such consultation. It is likely that grizzly bear habitat management would restrict to some degree timber harvests on currently roaded areas within the recovery area (Tom Wittinger, pers. comm. 1996). Based on the best available data (Tom Wittinger, Flathead Forest, pers. comm. 1996), it is estimated that reductions in timber harvest on affected national forest lands within the PAA would be between 8.3 and 39.7 million board feet per year over the next decade if Alternative 2 was implemented as proposed (see Table 4-10). Impacts to timber harvest could be less based on current land-use restrictions in Idaho that do not occur in Montana on the Flathead Forest (i.e. Pacfish, etc.). The large variation between the high and low estimates reflect the divergence between the planned Allowable Sale Quantity (ASQ) of timber from Forests in the PAA and the actual harvest volume which has occurred in recent years (see Table 3-11).

Impacts on Minerals Extraction.—Mineral extraction could be altered due to grizzly bear concerns in and by themselves, if grizzly bears were documented to be present in the BE.

Impacts on Domestic Livestock.—Elements of this alternative that will likely influence impacts on domestic livestock include: 1) natural recolonization of grizzly bears in central Idaho, with management as a threatened species under ESA; 2) intensive monitoring of grizzly bears to identify potential conflict sites; 3) control by agency personnel of any bears depredating on livestock through implementation of the Interagency Grizzly Bear Committee nuisance grizzly bear management guidelines (IGBC 1986) (Appendix 15).

Under this alternative grizzly bears may recolonize this area from other ecosystems. This process was estimated to require at least 50 years before grizzly bears might reach the area via range expansion from the CYE which is approximately 80 miles north. Once breeding populations were established it would conservatively require an additional 50-110 years to reach the recovered level of 280 bears. During the first few decades following establishment of a breeding population in the BE, bear numbers and depredations of livestock are expected to be very low. Following grizzly recovery, grizzly bears would be removed from ESA protection and the states of Idaho and Montana would continue to manage bears.

Under this alternative, most livestock depredations by grizzly bears could be expected to occur on the Clearwater, Nez Perce, Bitterroot, Panhandle, and Lolo National Forest grazing allotments. In addition, depredations could be possible in a thin band of surrounding private land.

During the summer grazing period, approximately 10,866 cattle and calves and 5,069 adult sheep and lambs are distributed on public grazing leases across five national forests affected by this alternative (Table 3-13). Some livestock on private land surrounding public lands are also believed to be susceptible to grizzly bear predation.

Grizzly depredation on livestock is highly variable between years and among areas. Projection of depredation rates from other areas is difficult because terrain, vegetation, size of farms, livestock husbandry practices, and food abundance will differ among areas. The following mathematical equation was developed by wolf biologists (USFWS 1994) and is being applied here to standardize depredation rates from the YE and NCDE in relation to total livestock and recovered bear numbers in the BE (280 bears) and estimate livestock losses.

$$\frac{\text{Number of cattle/sheep (Bitterroot Ecosystem)}}{\text{Number of cattle/sheep (Other Ecosystem)}} \times \frac{\text{Number of grizzly bears (Bitterroot)}}{\text{Number of grizzly bears (Other Ecosystem)}} \times \text{Mean annual depredations (Other Ecosystem)} = \text{Estimated annual depredations in Bitterroot}$$

Livestock present in the Yellowstone Ecosystem during 1992 were 146,000 cattle and 265,000 sheep (USFWS 1993). Livestock losses from the YE averaged 35 cattle per year during 1994-97 (Gunther et al. 1995, 1996, 1997, 1998). Sheep losses attributable to grizzly bears in the YE averaged 29 sheep per year during 1994-97 (Table 4-1). The YE grizzly bear minimum population estimate used for calculating livestock depredations was 245 bears (Eberhardt and Knight 1996) because the population estimate applied to the time period analyzed. Application of the equation to these data from the YE results in an estimate of 3 cattle and 1 sheep taken annually by a recovered grizzly bear population (280 bears) in the BE (Table 4-9).

Numbers of livestock grazing on public lands within the NCDE is less than either the YE or BE and allotments occur largely on the east side of the NCDE. However, livestock losses also occur on private lands within and adjacent to the NCDE in addition to those occurring on allotments. Losses of livestock to grizzly bears in the NCDE and peripheral lands including the Blackfoot Indian

Reservation have averaged 8 animals per year from 1986-94 (Madel 1996, D. Carney, pers. comm. 1996). Losses of sheep to grizzly bears in the NCDE including the Blackfoot Indian Reservation have averaged 17 animals per year from 1986-94 (Madel 1996, D. Carney, pers. comm. 1996). Estimates for total cattle were based on grazing allotments and numbers from the Blackfoot Indian Reservation. Estimates for total sheep were based on grazing allotments, numbers from the Blackfoot Indian Reservation, and numbers on private lands adjacent to public lands along the East Front. Livestock totaled 34,841 cattle and 8,500 sheep. The minimum grizzly bear population for the NCDE was calculated from sightings of females with cubs during 1993-95 as specified in the Recovery Plan (USFWS 1993) to be 516 bears. This minimum population estimate was used for calculating livestock depredations because it was applicable to the time period analyzed. Application of the formula to standardize depredation results in an estimated loss of 1 cow and 6 sheep annually in the BE when grizzly bear populations are fully recovered at a population of 280 (Table 4-9). Because livestock are in low numbers in the northern portion of the recovery area where bears are expected to exist in highest densities, livestock depredations could be less than either the NCDE or the YE. These predictions are statistical in nature and are not intended to show exact depredation expected in the BE, but should provide an indication of what may occur based on other ecosystems. Livestock losses have been reduced significantly in the last 3 years through modifications in animal husbandry practices such as the use of electric fences, removal of livestock carcasses, use of guard dogs, and conscientious herding practices (Madel 1996).

Table 4-9. Estimated livestock losses in the Bitterroot Ecosystem based on cattle numbers, grizzly bear numbers and rate of loss due to grizzly bears in the Yellowstone Ecosystem and the Northern Continental Divide Ecosystem. The livestock losses for the Bitterroot Ecosystem are projections based on rate of loss in the other ecosystems and are based on a recovered grizzly bear population of 280 individuals managed under *threatened* status described in Alternative 2.

Area	Minimum grizzly bear population (1996 estimate)	Cattle present	Average annual cattle losses (%)	Sheep present	Average annual sheep losses (%)
Yellowstone Ecosystem	245[a]	146,000	35 (0.024 %)	265,000	29 (0.1 %)
Northern Continental Divide Ecosystem	516[a]	34,841	8 (0.023 %)	8,500	17 (0.2 %)
Bitterroot Ecosystem recovery goal (experimental population area)	280	10,866	1-3	5,069	1-6

[a] YE and NCDE grizzly bear minimum population estimates used in depredation calculations are consistent with the years analyzed. The current minimum population estimates are listed in Chapter 3 “Source Populations.”

Impacts on other private property.—This alternative would not cause any impacts to private property until it was determined that grizzly bears were actually moving from other occupied ecosystems and expanding their ranges into the BE. If this did occur, then the number of nuisance

bear incidents would be commensurate with the number of bears that move over time. Impacts to other private property under this alternative would be the same as those described for Alternative 1, once a recovered population of 280 bears is established.

Based on what is currently known about bear behavior in these other ecosystems. Once bears are recovered, nuisance bear incidents would likely range between 0 and 74 per year in the BE. However, by the time bears would be recovered in the BE, much more would be known about proper sanitation and avoiding many of the potential conflicts between bears and humans, and therefore, conflicts should be greatly reduced.

Conclusions.—This no action alternative could alter existing and ongoing land-use activities (including timber harvest and minerals extraction activities) solely for grizzly bears if grizzly bears naturally recolonize the BE and documentation of their presence triggers ESA Section 7 consultation requirements. If proposed research (initiated upon documented presence of grizzly bears in the BE) determines that current habitat management is not adequate to maintain suitable grizzly bear habitat, or that linkage zone restrictions are necessary to promote grizzly bear recolonization of the recovery zone, then recommendations could be made to alter land-use activities within these areas. If recolonization and recovery (280 bears) occurs within the recovery zone, yearly livestock losses to depredation by bears could range from 1-3 cattle and 1-6 sheep. Based on what is currently known about bear behavior in the NCDE and YE, nuisance bear incidents would likely range between 0 and 74 per year at recovered population levels. However, conflicts should be reduced in the future because much more would be known about proper sanitation and avoiding many of the potential conflicts between bears and humans. The IGBC (1986) nuisance grizzly bear management guidelines (Appendix 15) would be implemented by the USFWS in cooperation with state agencies to control grizzly bears in conflict with humans or domestic animals. If illegal killing or legal taking (control) of grizzly bears appears to be preventing recovery, then land-use restrictions could be implemented.

Impacts on Wildlife Populations

Under this alternative, there is only a remote likelihood that recovery of grizzly bears in the BE would occur through natural recolonization because grizzly bears do not readily colonize distant, disjunct areas such as the BE. If bears did naturally recolonize the BE, it could take at least 50 years for reproducing populations of bears from the CYE to expand to the Selway-Bitterroot Wilderness, which is 80 miles away. Once reproducing populations of grizzly bears reached the BE, it would conservatively require an additional 50-110 years to reach the recovered level of 280 bears (see Figure 2-3). Thus the estimated time to recover grizzly bears in the BE under this alternative is at least 100-160 years.

This alternative would not have any impact to wildlife populations in the BE until it was determined that grizzly bears were actually moving from other occupied ecosystems and expanding their ranges into the BE. If this did occur, there would be a gradual increase in predation on wildlife populations (mainly ungulates) commensurate with the number of bears that move over time. The overall impact

would likely be lower rates of predation by grizzly bears over a longer time frame than Alternative 1 until a recovered population was established. The discussion located in Chapter 4 under Alternative 1, "Impacts on Wildlife" would apply if grizzly bears naturally recolonized the BE and a recovered population was established.

Conclusions.—If grizzly bears naturally recolonized the BE, recovery would take longer to achieve under this alternative than under Alternative 1, and the level of predation caused by grizzly bears would increase more gradually over a longer period of time as the grizzly bear population slowly increased and expanded at a natural rate. A recovery-level grizzly bear population (280 bears) is expected to have the same impact on wildlife populations under this alternative as under Alternative 1.

Impacts on Public Access and Recreational Use

Visitor Use.—There would be no impacts to existing visitor/recreation use levels unless grizzly bears began to naturally recolonize the BE. If this occurred, impacts to visitor use would be similar to those discussed for Alternative 1.

Trail and Road Closures.—This alternative could alter existing and ongoing land-use activities solely for grizzly bears. If grizzly bears naturally recolonize the BE, they would be protected under the ESA as a threatened species and all federal activities that may affect grizzly bears would have to go through Section 7 consultation with the USFWS. There could be impacts to public access in the form of road and trail closures at that time. Also, per direction of the Grizzly Bear Recovery Plan, the USFWS is currently leading a 5-year process to assess the linkage potential between the various ecosystems identified for grizzly bear recovery. This linkage zone analysis is ongoing and will proceed. Upon documentation of grizzly bear presence in the BE, the, USFWS would coordinate further research studies to determine the need for and location of linkage zones, and to identify specific habitat management guidelines necessary to maintain suitable habitat within linkage zones. If research determines that linkage zones are necessary for recovery, and that changes in habitat management within the identified zones or the recovery zone are necessary, then the USFWS would recommend appropriate management actions.

Hunting seasons.—Under this alternative, there are no proposed changes in hunting seasons. If grizzly bears recovered naturally in the BE, then it is predicted that 280 grizzly bears will kill a maximum of 504 ungulates per year. Interactions with other predators and the compensatory nature of some predation may affect the total loss of ungulates to predators, but at this rate only 0.11% of the pre-harvest ungulate population will be preyed upon by a recovered bear population. This small loss of ungulates is not expected to result in changes of big game seasons, although changes could occur to address conflicts with grizzly bear recovery.

Conclusions.—There could be impacts to public access and recreational use under this alternative if grizzly bears naturally recolonize the BE. If natural recovery occurred, then some people would avoid recreating in the recovery zone as a result of grizzly bear presence and other people would

increase their recreation in the area because of it. The vast majority of recreationists and resource area users would continue to use the recovery zone with little change in their trip frequency or length. Over time, recreation and visitor use of the PAA would continue to increase. If grizzly bears naturally recolonize the BE, they would be protected under the ESA as a threatened species and all federal activities that may affect grizzly bears would have to go through Section 7 consultation with the USFWS. There could be impacts to public access in the form of road and trail closures at that time. Also, if USFWS research (initiated upon grizzly bear presence in the BE) determines that linkage zones are necessary for recovery, and that changes in habitat management within the identified zones are necessary, then they would recommend appropriate management actions at that time. No changes in hunting seasons are currently anticipated as a result of implementation of this alternative, although changes could occur.

Impacts on Economics and the Social Environment

Under the No Action Alternative - Natural Recovery it is uncertain how long the population would take to recover, and indeed if it ever would. Therefore many effects from a recovered or recovering population of grizzly bears in the BE would not likely be felt for many decades or, perhaps, ever.

Impact on the Economic Value Associated with Hunter Harvest.—The economic impact on hunter harvest in the BE of natural recovery is likely to be the same as under Alternative 1. That is, no economic losses associated with reduced hunter harvest.

Economic Impact on Domestic Livestock.—It is estimated that livestock depredation under the natural recovery alternative would be significantly less than under Alternative 1 (1 to 3 cattle and 1 to 6 sheep) once recovering populations inhabit the BE. This level of depredation would likely be reached only after a number of decades. Due to the long time period before any possible grizzly bear population recovery is expected under this alternative, and uncertainty that the population will ever naturally recover, dollar losses due to livestock predation under Alternative 2 are assumed to be zero.

Economic Effect of Land Use Restrictions on Recreation.—It is estimated that natural recovery of grizzly bears within the BE could lead to restrictions on recreation and associated economic loss. Economic losses associated with these restrictions, however, would likely be more than offset by improvements in recreational opportunities for hunters and fishermen from habitat improvements and reduced sedimentation rates in roaded areas (Christensen et al. 1993, Garrity 1996).

One aspect of restrictions on recreation which would have distributional effects within the economy concerns the imposition of regulations requiring outfitters operating within the recovery zone to use bear-proof garbage and food containers and methods when in the backcountry. The purchase of bear-proof containers or hoists would impose an additional expense on the outfitters operating within the recovery zone. These costs would represent transfers of income between the outfitters and those individuals or firms producing and selling the bear-proof products.

Economic Effect of Land Use Restrictions on Timber Harvest.—It is estimated that natural recovery of grizzly bears could lead to access restrictions which could affect timber harvest and produce associated economic impacts (Table 4-10). See discussion under Alternative 4 ("Economic Effect of Land Use Restrictions on Timber Harvest" section) for explanation of methodology used to calculate economic impacts presented in Table 4-10.

Table 4-10. Estimated 1999-2008 annual timber harvest reductions on affected roaded USFS lands within the primary analysis area (PAA) for Alternative 2.

Statistic	Low Estimate	High Estimate
Annual timber harvest on USFS lands within the PAA[a]	49	235
Annual reduction in timber harvest on affected currently roaded lands within the PAA due to grizzly habitat management restrictions	8.28[b]	39.72[b]
Estimated annual loss in direct timber harvest related jobs due to timber harvest restrictions[c]	55	264

[a] The USFS level detail behind these estimates can be found in Table 3-11.
[b] Based on an estimated reduction in ASQ in the Flathead National Forest of 16.9% forest-wide due to grizzly bear habitat management restrictions (Tom Wittinger, Flathead Forest, pers. comm.1996).
[c] Based on an estimated direct jobs per MMBF of timber harvest of 6.64 (Power 1992).

Economic Effect of Land Use Restrictions on Mining.—It is estimated that natural recovery of grizzly bears within the BE could affect mining subject to Section 7 consultation on mining activities.

Economic Effect of Changes in Visitor Use.— It is not expected that visitation will be significantly impacted by natural recovery of grizzly bears to the BE.

Economic Effects on the Value Potential Visitors Place on Grizzly Bears.—In the case of natural recovery, the benefits to existence values are the same as under Alternative 1 but this value is not realized until the grizzly bear population is recovered, or at least is beginning to recover. Because it might take 100 years or more for grizzly bear populations in the PAA to begin to recover on their own, if indeed they ever do, it is assumed that existence value due to bear recovery would be zero. In essence natural recovery is a continuation of the status quo for the foreseeable future and thus represents no welfare change for society in the form of realized existence values.

Conclusion.—It is estimated that Alternative 2 would lead to total costs of 140 thousand dollars per year for monitoring and management until recovery (Table 4-11). Additionally, it is estimated that an average of between 55 and 264 jobs would be lost due to reduced timber harvest.

Social Impacts

In the case of natural recovery, the social impacts are the same as under Alternative 1, but impacts would not occur until grizzly bears began to recover in the BE.

Table 4-11. Annual net social benefits associated with grizzly bear recovery in the BE under Alternative 2.

Category of Benefit / Loss	Type of Impact (Market / Non-Market)	Impacted Population / Area	Annual Impact (1996 dollars)	
			Low Estimate[a]	High Estimate[a]
(A) Benefits Associated With Grizzly Bear Recovery				
Annual net economic value of recovery	non-market	United States population	0	0
(B) Costs Associated With Grizzly Bear Recovery				
Value of hunting losses	market and non-market	hunters and local businesses	0	0
Value of livestock losses	market	ranchers	0	0
Annual grizzly bear management cost during first 5 years of program	market	United States taxpayers	140,000	140,000
Net job loss from reduced timber harvest	market	local area workers and businesses	55	264

[a] For the benefits estimates, the low and high estimates represent a 95% confidence interval on the estimates of net willingness pay for the alternative. For the individual costs, the low and high estimates represent the best estimates of minimum and maximum costs associated with an alternative. The final net benefits figures do not represent a confidence interval but rather a plausible range of benefits associated with the alternative.

ENVIRONMENTAL CONSEQUENCES
ALTERNATIVE 3. NO GRIZZLY BEAR ALTERNATIVE

Impacts on Human Health and Safety

The federal government and the states of Idaho and Montana would remove grizzly bears from threatened species status and ESA protection within the BE (central Idaho and west-central Montana). Unregulated killing by the public and extirpation or removal by agencies would likely prevent any possible grizzly bear recovery in this area. The risk of injury from grizzly bears would be virtually nonexistent. The risk of grizzly bear-associated injury during wilderness travel would remain nearly unchanged from that existing today. The fear associated with the risk of encountering bears would be reduced due to the assumption that grizzly bears would not be present.

Conclusions.—The risk of injury from grizzly bears would be virtually nonexistent because grizzly bear recovery would be prevented in the BE.

Impacts on Source Populations of Grizzly Bears

There would be no impacts to source populations, because grizzly bears would not be reintroduced to the BE under this alternative.

Impacts on Land-Use Activities

There would be no impacts to land-use activities because this alternative would not result in any changes to current land-uses. There would be no impact to timber harvest, minerals extraction, livestock grazing, or other private property from the implementation of this alternative.

Impacts on Wildlife Populations

Because grizzly bears would not be recovered in the BE under this alternative, there would be no impact to the ecological and predator-prey relationships that currently exist. Grizzly bears may occasionally disperse or travel through the BE, but that would be rare, and predation by these few animals would be inconsequential. There would be no measurable impact to wildlife populations from the implementation of this alternative.

Impacts on Public Access and Recreational Use

Conclusions.—Implementation of Alternative 3 could have varied but subtle impacts on visitor use in central Idaho. Because 11.9% of local, 6.2% of regional, and 6.0% of national respondents surveyed said they would visit the BE less often if grizzly bears were present (Duda and Young 1995) (see Table 4-5), some people may venture into the central Idaho backcountry in the future who wouldn't if grizzly bears were present. Grizzly bears are a high profile species with interest nationwide. A survey of Yellowstone National Park visitors found that respondents ranked the grizzly bear highest among wildlife species they would most like to see on their trip to the park (Duffield 1992). Because of national interest in grizzly bear recovery, implementation of Alternative

3 could cause some nonresidents to not visit the BE, due to their dissatisfaction with cessation of protection for the grizzly bear.

There would be no change to existing public access management in the BE from implementation of this alternative. Since there are no roads or trails currently restricted for grizzly bear protection in the BE, there would be no change to this existing condition from the implementation of this alternative. There would also be no impact on hunter harvest or management of big game populations in the BE from implementation of this alternative.

Conclusions.—Implementation of Alternative 3 could have varied but subtle impacts on visitor use in the BE. There would be no measurable impact to recreational use, or public access from implementation of this alternative. There would be no impact on hunting seasons or hunter opportunity.

Impacts on Economics and the Social Environment

Impact on the Economic Value Associated with Hunter Harvest.—Under a policy of no grizzly bears present in the BE, there would be no reduction in hunter harvest due to this species. Consequently, there would be no economic loss to hunters associated with grizzly bears in the area.

Economic Impact on Domestic Livestock.—In the absence of grizzly bears in the BE there would be no economic loss associated with grizzly predation on livestock in the area.

Economic Effect of Land Use Restrictions on Recreation, Timber Harvest, and Mining.—In the absence of grizzly bears in the BE there would be no economic loss associated with land use restrictions on recreation, timber harvest, or mining.

Economic Effect of Changes in Visitor Use.—As under Alternative 1, it is not expected that visitation will be significantly impacted by a "no grizzly bear" policy in the BE.

Impact on the Existence Value of Grizzly Bears.—In the absence of grizzly bears in the BE, there is a continuation of current population levels. Accordingly, there is no change in existence values.

Conclusion.—The only estimated costs of this alternative are management costs necessary to develop the required legislation to change existing laws and regulations. The total cost is estimated at a minimum of $2,000,000 spread over several years. No measurable benefits have been associated with this alternative.

Social Impacts

Social impacts under this alternative would be minimal as this alternative essentially seeks to maintain the current status quo.

ENVIRONMENTAL CONSEQUENCES ALTERNATIVE 4. RESTORATION OF GRIZZLY BEARS AS A THREATENED POPULATION WITH FULL PROTECTION OF THE ESA AND HABITAT RESTORATION

Impacts on Human Health and Safety

Impacts on human health and safety from implementation of this alternative would be similar to those described for Alternative 1. The BE grizzly bear population would be managed as a threatened population with full protection of the ESA under this alternative.

Conclusions.— During the first several decades following reintroduction, chance of injury caused by grizzly bears would be exceedingly small due to the low density of bears in the area. Under this alternative populations are estimated to achieve recovery levels of approximately 400 bears in a minimum of 65, and likely more than 125 years. Using human injury rates in the NCDE and YE, and recognizing a net increase in human visitation, projections for human injury, once bears are recovered 65-125 years in the future, are less than one injury per year and less than one grizzly bear-induced human mortality every few decades.

Impacts on Source Populations of Grizzly Bears

Impacts to source populations under this alternative would be similar to those described for Alternative 1. Reintroduction of grizzly bears into the BE would require capture and relocation of a minimum of 25 bears over a period of 5 years from other areas. Three sources of bears for the BE have been identified: southeast British Columbia, the Northern Continental Divide Ecosystem (NCDE) population in northwest Montana, and the Yellowstone Ecosystem (YE) population. An equal contribution of bear numbers would be made from Canada and the U. S. MDFWP has stated their willingness to use grizzly bears from the NCDE to augment populations elsewhere or reintroduce the species where recovery areas have been identified (Dood and Ihsle Pac 1993, page 107). An attempt was made to transplant a grizzly bear to the Cabinet Mountains from the NCDE in 1992 but trapping efforts to capture a subadult female were not successful (Kasworm et al. 1993).

Conclusions.—It appears that source areas for reintroduction of grizzly bears into the BE could be both the NCDE and/or YE (based on mortality levels) in Montana and the Kootenay Region in British Columbia, Canada. These areas have habitat similar to the BE and have sufficient numbers of bears to be a source area. Agreement to supply grizzly bears is not an assurance that bears having history of no conflict with humans, and proper age and sex will be available to the BE reintroduction program. The actual capture of the necessary bears is dependent upon access to areas with such bears, and significant effort by capture crews. Capture of desired bears is not assured, even with intensive effort. It may require more than 5 years to obtain the desired minimum of 25 bears to initiate a new population in the BE. This should be made clear to the public and to cooperating agencies at the outset. There would be no significant detrimental effects to the health of source populations because mortality limits in the Grizzly Bear Recovery Plan (USFWS 1993) and British

Columbia grizzly bear management criteria (B.C. Min. Environ., Lands, and Parks 1995) would be met during implementation of this alternative. Further, since no bears would be removed from the YE or NCDE if the mortality limits would be exceeded, and no female bears would be removed from within the recovery zone or within 10 miles of the recovery zone boundary of either ecosystem, then the effects on recovery of any removals of bears from the NCDE or YE would be nonexistent.

Impacts on Land-Use Activities

Grizzly bears would be reintroduced into the BE without an experimental population rule and would be fully protected by all provisions of the ESA as a threatened species until recovery was achieved. Because grizzly bears would be listed as a fully protected threatened species, all federal actions within the recovery zone would be subject to ESA Section 7 consultation with the USFWS.

Impacts on Timber Harvest.—Land-use restrictions such as reduction in the number of open roads and the elimination of new roads and logging on lands currently roadless would be implemented. Road building and timber harvest would not be allowed on federal lands within the recovery zone that are presently roadless. Within the Lolo Restoration Area and Special Corridor Management Areas, road densities would be reduced to an average of no more than 0.25 miles per square mile. This would require closure and reclamation of about 3500 miles of roads. The Magruder Road would be reclaimed and converted to a pack trail from Magruder crossing 23 miles west to Sabe Saddle. The Hells Half Acre Mountain Road would be reclaimed over the entire eight mile length. USFS Forest Plans and BLM Area Management Plans would require amendments or revisions to implement these standards.

Alternative 4 would prohibit future timber harvests on unroaded USFS lands within the recovery zone (Garrity 1996). Additionally, it is likely that grizzly bear habitat management would restrict to some degree timber harvests on currently roaded areas within the recovery area (Tom Wittinger, pers. comm. 1996). Based on the best available data (Tom Wittinger, Flathead Forest, pers. comm. 1996), it is estimated that reductions in timber harvest on national forest lands within the PAA would be between 40 and 194 million board feet per year over the next decade if Alternative 4 grizzly bear recovery were implemented as proposed (see Table 4-16). Impacts to timber harvest could be less based on current land-use restrictions in Idaho that do not occur in Montana on the Flathead Forest (i.e. Pacfish, etc.). The large variation between the high and low estimates reflect the divergence between the planned Allowable Sale Quantity (ASQ) of timber from Forests in the PAA and the actual harvest volume which has occurred in recent years (see Table 3-11). Also reflected is the difference between the percentage of annual timber volume from Forests in the PAA planned to be cut from roadless areas (from Forest Plans), and the percentage of annual timber volume that was actually harvested from these roadless areas. The weighted average of the percentage of ASQ that was planned (from Forest Plans) to be harvested from roadless areas of USFS lands in the PAA is 31.6% (Randy Gay, pers. comm. 1996). However, an estimate of the percentage of actual timber volume sold (1992-1995) that came from USFS roadless areas is <5% (Randy Gay, pers. comm 1996). Garrity (1996) estimated that implementation of this alternative would result in an annual

reduction in timber sales over the next decade of 179 million board feet. Although methodology of Garrity differed from that presented here, his estimate is within the range of estimates developed here.

Impacts on Minerals Extraction.—Mineral extraction activities would not likely be altered due to grizzly bear concerns in and by themselves, however road closures as prescribed under Alternative 4 and Section 7 consultation (on a project basis) could impact extraction activities to an unknown degree. Recommendations may be made by the Scientific Committee to reduce potential impacts if the need arises.

Impacts on Domestic Livestock.—Elements of this alternative that will likely influence impacts on domestic livestock include: 1) reintroduction of grizzly bears into central Idaho, with management as a threatened species under ESA; 2) intensive monitoring of grizzly bears to identify potential conflict sites; 3) control by agency personnel of any bears depredating on livestock through implementation of the Interagency Grizzly Bear Committee nuisance grizzly bear management guidelines (IGBC 1986) (Appendix 15).

Grizzly bears would be released in areas of central Idaho that have low densities of livestock. During the first few decades after this alternative is implemented, bear numbers and depredations of livestock are expected to be very low. Following grizzly recovery, grizzly bears would be removed from ESA protection and the states of Idaho and Montana would continue to manage bears.

Most livestock depredations by grizzly bears in the 14 county PAA are expected to occur in the 18,489,989 acre block of contiguous USDA Forest Service land. In addition, depredations could occur in a thin band of surrounding private land.

During the summer grazing period, approximately 68,811 cattle and calves and 229,188 adult sheep and lambs are distributed on public grazing leases across the PAA (Table 3-13). Some livestock on private land surrounding public lands are also believed to be susceptible to grizzly bear predation.

Grizzly depredation on livestock is highly variable between years and among areas. Projection of depredation rates from other areas is difficult because terrain, vegetation, size of farms, livestock husbandry practices, and food abundance will differ among areas. The following mathematical equation was developed by wolf biologists (USFWS 1994) and is being applied here to standardize depredation rates from the Yellowstone (YE) and Northern Continental Divide Ecosystems (NCDE) in relation to total livestock and recovered bear numbers in the Bitterroot (400 bears) and estimate livestock losses.

$$\frac{\text{Number of cattle/sheep (Bitterroot Ecosystem)}}{\text{Number of cattle/sheep (Other Ecosystem)}} \times \frac{\text{Number of grizzly bears (Bitterroot)}}{\text{Number of grizzly bears (Other Ecosystem)}} \times \text{Mean annual depredations (Other Ecosystem)} = \text{Estimated annual depredations in Bitterroot}$$

Livestock present in the Yellowstone Ecosystem during 1992 were 146,000 cattle and 265,000 sheep (USFWS 1993). Livestock losses from the YE averaged 35 cattle per year during 1994-97 (Gunther et al. 1995, 1996, 1997, 1998). Sheep losses attributable to grizzly bears in the YE averaged 29 sheep per year during 1994-97 (Table 4-1). The YE grizzly bear minimum population estimate used for calculating livestock depredations was 245 bears (Eberhardt and Knight 1996) because the population estimate applied to the time period analyzed. Application of the equation to these data from the YE results in an estimate of 27 cattle and 41 sheep taken annually by a recovered grizzly bear population (400 bears) in the BE (Table 4-12).

Numbers of livestock grazing on public lands within the NCDE is less than either the YE or BE and allotments occur largely on the east side of the NCDE. However, livestock losses also occur on private lands within and adjacent to the NCDE in addition to those occurring on allotments. Losses of livestock to grizzly bears in the NCDE and peripheral lands including the Blackfoot Indian Reservation have averaged 8 animals per year from 1986-94 (Madel 1996, D. Carney, pers. comm. 1996). Losses of sheep to grizzly bears in the NCDE including the Blackfoot Indian Reservation have averaged 17 animals per year from 1986-94 (Madel 1996, D. Carney, pers. comm. 1996). Estimates for total cattle were based on grazing allotments and numbers from the Blackfoot Indian Reservation. Estimates for total sheep were based on grazing allotments, numbers from the Blackfoot Indian Reservation, and numbers on private lands adjacent to public lands along the East Front. Livestock totaled 34,841 cattle and 8,500 sheep. The minimum grizzly bear population for the NCDE was calculated from sightings of females with cubs during 1993-95 as specified in the Recovery Plan (USFWS 1993) to be 516 bears. This minimum population estimate was used for calculating livestock depredations because it was applicable to the time period analyzed. Application of the formula to standardize depredation results in an estimated loss of 12 cattle and 355 sheep annually in the BE when grizzly bear populations are fully recovered at a population of 400 (Table 4-12). Because livestock are in low numbers in the northern portion of the recovery area where bears are expected to exist in highest densities, livestock depredations could be less than either the NCDE or the YE. These predictions are statistical in nature and are not intended to show exact depredation expected in the BE, but should provide an indication of what may occur based on other ecosystems. Livestock losses have been reduced significantly in the last 3 years through modifications in animal husbandry practices such as the use of electric fences, removal of livestock carcasses, use of guard dogs, and conscientious herding practices (Madel 1996).

Impacts on other private property.— Impacts to other private property under this alternative would be the same as those described for Alternative 1. Based on what is currently known about bear behavior in other ecosystems, once bears are recovered, nuisance bear incidents would likely range between 0 and 105 per year in the BE. However, by the time bears would be recovered in the BE, much more would be known about proper sanitation and avoiding many of the potential conflicts between bears and humans, and therefore, conflicts should be greatly reduced.

Table 4-12. Estimated livestock losses in the Bitterroot Ecosystem based on cattle numbers, grizzly bear numbers and rate of loss due to grizzly bears in the Yellowstone Ecosystem and the Northern Continental Divide Ecosystem. The livestock losses for the BE are projections based on rate of loss in the other ecosystems and are based on a recovered grizzly bear population of 400 individuals managed under threatened status described in Alternative 4.

Area	Minimum grizzly bear population (1996 estimate)	Cattle present	Average annual cattle losses (%)	Sheep present	Average annual sheep losses (%)
Yellowstone Ecosystem	245[a]	146,000	35 (0.024 %)	265,000	29 (0.01 %)
Northern Continental Divide Ecosystem	516[a]	34,841	8 (0.023 %)	8,500	17 (0.2 %)
Bitterroot Ecosystem recovery goal (PAA)	400	68,811	12-27	229,188	41-355

[a] YE and NCDE grizzly bear minimum population estimates used in depredation calculations are consistent with the years analyzed. The current minimum population estimates are listed in Chapter 3 "Source Populations."

Conclusions.—Alternative 4 would prohibit future timber harvests on unroaded USFS lands within the recovery zone. Additionally, it is likely that grizzly bear habitat management would restrict to some degree timber harvests on currently roaded areas within the recovery area (Tom Wittinger, pers. comm. 1996). It is estimated that reductions in timber harvest on national forest lands within the PAA would be between 40 and 194 million board feet per year over the next decade if Alternative 4 grizzly bear recovery were implemented as proposed (see Table 4-16). Mineral extraction activities would not likely be altered due to grizzly bear concerns in and by themselves, however road closures as prescribed under Alternative 4 and Section 7 consultation (on a project basis) could impact extraction activities to an unknown degree.

Livestock grazing within the recovery zone occurs predominantly in the southern portion of the BE (Figure 3-8, Table 3-13). Consequently, at recovered grizzly population levels and current livestock stocking rates, impacts to livestock would be expected to be similar to levels occurring in portions of the NCDE and the YE. In 65-125+ years (the estimated time to recovery assuming a 4% and 2% growth rates) grizzly bears would likely be present within the southern portion of the BE. Projections indicate that at a grizzly bear population level of 400 bears in the recovery zone, yearly livestock losses to depredation by bears could range from 12-27 cattle and 41-355 sheep. Management activities would try to preempt livestock problems.

Once bears are recovered in the BE (a minimum of 65-125 years after reintroduction), nuisance bear incidents would likely range between 0 and 105 per year. However, by the time bears would be

recovered in the BE, conflicts should be greatly reduced because much more would be known about proper sanitation and avoiding many of the potential conflicts between bears and humans.

Impacts on Wildlife Populations

Grizzly bears are omnivores, but primarily feed on vegetation. Studies indicate that a grizzly bear diet consists of about 90% vegetable and insect matter. They do scavenge and occasionally prey on game animals, in addition to ground dwelling rodents which they actively dig out of dens. Research has documented the importance of local concentrations of ungulates as a source of protein for grizzly bears (IGBC 1987). In many locations, animal matter may not constitute a major annual diet item, but may be seasonally vital to bears (Mattson et al. 1991, Gunther and Haroldson In press).

Several studies have attempted to estimate predation by grizzly bears. Studies in the YE indicate that some grizzly bears are active predators on elk calves. Researchers made 944 sightings of grizzly bears on elk calving grounds over 5 years and documented 70 hunts for elk calves of which 26 were successful (Gunther and Renkin 1990). These researchers noted that the percentage of successful hunts declined dramatically during July as calves became more mobile. Mattson (1997) indicated that grizzly bear predation rates averaged 1.4 or 5.8 ungulates per year for adult female and male bears, respectively. Mattson found that bears preferred small prey in the form of elk and moose calves and occasionally adults. French and French (1990) found that although some bears were active predators, not all bears were very successful or even attempted to prey on elk calves. The authors further suggested that predation on elk calves is a learned behavior and is likely facilitated when cubs are raised by predacious mothers. Ungulates, especially elk, were part of the diet when they were the most available and vulnerable, such as calves, winter-killed or weakened animals during spring (Green and Mattson 1988), and weakened bulls during the fall rut (Schleyer 1983).

Based on different studies conducted in North America, bear predation and effectiveness is partly a result of vegetation type and cover, and may be a local phenomenon based on a variety of conditions enhancing predation effectiveness. Although Schlegal (1976) and Gratson and Zager (1999) documented significant black bear predation on elk calves in one study area where spring bear range and elk calving areas overlap in Idaho, it is unclear if similar circumstances are more widespread. Given expected population levels and densities, grizzly bear predation impacts are unlikely to reach levels currently occurring for black bears.

Research conducted in and near Glacier National Park indicated that predation attributed to grizzly bears accounted for 2%, 0%, and 4% of the elk, deer, and moose monitored in their study area respectively (Kunkel and Pletcher 1994). This study documented a total of 19 predator kills of elk from 1990-1995, 3 of which were caused by grizzly bears. All 3 were older elk (age 11-16). During this same time, 11 moose were known to be killed by predation, 5 of which were attributed to grizzly bears. Grizzly population density estimates for their study area are about 1 bear per 6-8 square miles (Martinka 1974, McLellan 1989), and are perhaps 10-15 times higher than density estimates

expected at recovered levels in the BE (1 bear per 50-100 square miles). Therefore, when grizzly bear populations reach recovery levels in the BE, the predation rate could be a fraction of levels in or near Glacier National Park. An expected predation rate of 0.30-0.54% of the ungulate populations in the area occupied by bears could occur.

Using Mattson's (1997) estimate of 1.4 or 5.8 ungulates per year for adult female and male bears respectively, a population of 400 bears (USFWS 1996) would be expected to prey upon a maximum of 720 ungulates per year across the BE. This calculation assumes a 50:50 sex ratio and a 50:50 adult subadult ratio. The loss of a maximum of 720 ungulates to a recovered grizzly bear population would represent approximately 0.15% of estimated ungulate populations in the PAA (Table 4-13).

Table 4-13. Estimated predation on ungulates by grizzly bears in the Primary Analysis Area as a percent of the pre-hunting season ungulate populations and different grizzly population levels. Estimates resulting from two different models (Mattson 1997)[a] and (Kunkel & Pletcher 1994)[b] shown.

Grizzly bear population[c]	Annual kill of ungulates[d]		Percent of ungulates (%)[e]	
	Mattson Model (Mattson 1997)	Kunkel & Pletcher Model (1994)	Mattson Model (Mattson 1997)[f]	Kunkel & Pletcher Model (1994)[fd]
50	90	49	0.07	0.04
100	180	101	0.13	0.08
200	360	202	0.27	0.15
300	540	303	0.38	0.23
400	720	404	0.54	0.30

[a] Mattson (1997) study analyzed predation of elk, moose, and bison.
[b] Kunkel and Pletcher (1994) study analyzed predation of elk and moose.
[c] Population assumed to be 50% adult and a 50:50 sex ratio.
[d] Predation rate of 1.4 and 5.8 ungulates per year for adult male and female bears respectively (Mattson 1997).
[e] Total pre-hunting season elk and moose population is 133,968 (see Table 3-22).
[f] Rates based on (bears per square mile densities) x (observed predation rate) x (total elk and moose numbers in PAA).

Annual mortality in big game can result from harsh weather, hunters, disease, predation, and other factors. These factors can interact to accentuate or negate the other. For instance bad weather may concentrate big game to make them more susceptible to hunting, predation, or disease. Furthermore an animal weakened by disease may be more susceptible to predation or winter kill. These factors make it difficult to determine whether a 0-1% grizzly predation rate would be compensatory or additive. In addition, annual fluctuations in weather can cause ungulate populations to increase or decrease by as much as 10-15%. Such a reduction occurred between the winters of 1994-1997 in the northern PAA. Idaho Game Management Units 10 and 12 experienced a 40% population decline

during this period. Research has indicated predation by black bears and mountain lions in this area can be a significant cause of calf elk mortality, and likely has contributed to the population decline in this area (Gratson and Zager 1999). The restoration of grizzly bears would likely have an impact on black bear use of the ungulate resource through competition. This would likely mask any potential grizzly predation of 0-1% on ungulates within the PAA. It should therefore not be necessary to adjust hunting seasons to compensate for grizzly bear predation.

Grizzly and black bear population relationships have also been studied in selected areas. Mattson et al. (1992), documented one instance of an adult male grizzly bear preying upon a black bear in the YE. They also found that less than 0.15% of the 6,979 grizzly bear scats examined contained remains of black bears. During a 1984 drought in the North Fork of the Flathead River, grizzly bears from Glacier National Park made greater use of river bottoms typically frequented by black bears (Jonkel 1984). Black bears were less common in the river bottom during this time and may have been displaced or preyed upon by grizzly bears. Still, areas in Glacier Park have extremely high densities of both grizzly and black bear populations. Based on Park observation records (Glacier Park unpublished data 1980-1984, Nadeau pers. comm. 1996), a spatial partitioning of resources occurs as black bears and grizzly bears frequently occupy and forage in separate areas, thus avoiding conflict and maximizing foraging effectiveness. Researchers in Wyoming have found where grizzly and black bears coexist, black bears become diurnal and occupy more forested habitat than grizzly bears. Adult male grizzly bears were nocturnal and occupied open habitat, females and subadult grizzly bears were crepuscular (active at dawn and dusk) and avoided male grizzly beras (Holm, In press). Although some displacement occurs where grizzly and black bears coexist, potential long-term impacts to black bear population dynamics is unclear, but felt to be minimal.

Conclusions.—In many locations, animal matter may not constitute a major annual diet item, but may be seasonally vital to bears (Mattson et al. 1991). An expected predation rate of 0.30-0.54% of the ungulate populations in the area occupied by bears in the BE could occur. Using Mattson's (1997) estimate of 1.4 or 5.8 ungulates per year for adult female and male bears respectively, a population of 400 bears (USFWS 1993) would be expected to prey upon a maximum of 720 ungulates per year across the BE. The loss of 720 ungulates to a recovered grizzly bear population would represent approximately 0.15% of estimated pre-harvest populations of ungulates in the PAA. Potential long-term impacts to black bear population dynamics is unclear, but felt to be minimal. Overall impacts of a recovered population of grizzly bears on other wildlife populations are expected to be minimal. It should not be necessary to adjust hunting seasons to compensate for grizzly bear predation on other wildlife. Any restrictions on black bear hunters or other hunting opportunities to reduce the likelihood of mistaken identity kills or to address other potential conflicts could be recommended by the Scientific Committee, but would have to be acceptable and implemented by the IDFG and MDFWP. Grizzly bears would kill some healthy ungulates, but a large percentage of prey killed by bears will be very young, very old, sick, injured, or otherwise disadvantaged. Consequently, fewer ungulates may die from malnutrition associated with winter stress. To a small extent, competition among ungulates for food and space will be reduced, and the health of surviving

ungulates may be increased an undetermined, but probably minimal amount. Impacts to other listed wildlife and fish species would be similar to those listed for Alternative 1.

Impacts on Public Access and Recreational Use

Visitor use.—Impacts to visitor use from the implementation of this alternative would be similar to those described for Alternative 1. There might be a slight decrease in visitor use under this alternative as compared with Alternative 1 due to restricted access from the proposed road closures. This may be offset, however, by an increase in visitors seeking a remote backcountry experience, which the road closures would help to provide.

As with Alternative 1, despite some possible temporary changes in visitation rates (up or down) as a result of reintroduction, little overall change in increasing visitation rates would be expected over time. Visitation will continue to increase as a result of expanding population pressures and the subsequent increased demand for outdoor recreation opportunities.

Road and Trail Closures.—This alternative calls for no new road building in current roadless areas and the closure and reclamation of almost 3,500 miles of roads within the Corridor Special Management Area, the Lolo Restoration Area, and the Magruder Restoration Area. Furthermore, open road density would be limited to 0.25 miles per square mile within these management areas. These actions will reduce opportunities for road-oriented recreation activities. However, road closures are likely to benefit big game populations, particularly elk (Christensen et al. 1993), and may provide more opportunities for elk hunting. Reclamation of roads would lead to reduced rates of sedimentation which affects spawning and rearing of numerous fish species. These actions would likely improve habitat conditions for both resident and anadromous fish species and may result in improved recreational fishing opportunities.

No trail closures are anticipated for grizzly bears. In the NCDE where a minimum population of about 325 grizzly bears currently exists, only one trail was closed on national forest lands because of grizzly bears in the last 10 years (USFS, Unpubl. data 1996). This closure was a result of concerns for human safety when a bear was seen feeding on an elk carcass on a trail. During the peak of the visitor use season in Glacier National Park, fewer than 5% of the trails are closed at any time as a result of safety concerns. Because of the difference between national park and national forest management, closures in the BE would likely be rare and probably be similar to the NCDE.

Hunting seasons.—Under this alternative, there is a proposal to eliminate baiting and hound hunting of black bears within the Selway-Bitterroot Wilderness, Lochsa drainage, and upper North Fork of the Clearwater drainage. The state of Montana does not allow the use of dogs or bait in the hunting of black bears and this proposal would not affect black bear hunting opportunity. Any changes in baiting and hound hunting would require authorization by the Idaho Fish and Game Commission. Black bear hunting seasons in Idaho currently extend from April 15 to June 15 and September 15 to October 15. Black bear harvest data from this area (Beecham 1995) indicated that hunters using

dogs or bait accounted for 56% of the bear harvest in the hunting units outside of the Wilderness, but only 13% of the harvest within the wilderness during 1989-94 (Table 4-14). Average annual harvest by hunters using bait or dogs was 87 bears. Black bear hunters in the Clearwater Region expended 31,651 hunter-days and averaged 52 days of total hunter effort per bear harvested (Beecham 1995). Total harvest by hunters using bait or dogs and average days per bear harvested would indicate a potential loss of 4,524 hunter days of recreation, but this loss may be short-term. Black bear hunters would still have the opportunity to hunt bears without the use of dogs or bait and the total decline in hunter days or harvest is likely to be much less than these predictions. The use of bait and dogs for black bear hunting in Idaho Big Game Management Unit (BGMU) 1 was eliminated in 1984 and 1986 respectively (Beecham 1995). Prior to any of these changes in 1983, harvest was 171 black bears. With the prohibition of these techniques, harvest declined to 64 bears in 1988, but has increased since that time. The 1989-1994 average harvest in BGMU 1 was 164 bears. If similar results occurred in the districts affected by this proposal the effects on black bear harvest would be minor.

It is predicted that a recovered grizzly bear population of 400 bears will kill a maximum of 720 ungulates per year. Interactions with other predators and the compensatory nature of some predation may affect the total loss of ungulates to predators, but at this rate only 0.15 percent of the pre-harvest ungulate population will be preyed upon by a recovered bear population. This small loss of ungulates is not expected to result in changes of big game seasons.

Table 4-14. Average annual black bear harvest by hunting technique in areas affected by proposed elimination of baiting and dogs, 1989-94 (Beecham 1995).

Hunting technique	Annual black bear harvest in Nonwilderness hunting units[a]	Annual black bear harvest in Wilderness hunting units[b]
Bait	28	3
Dogs	52	5
Other	62	53
Total	142	61

[a] Big Game Management Units (BGMU) 10 and 12.
[b] BGMU 16a, 17, 19 and 20.

Conclusions.—Under this alternative, road-oriented recreation would decline and black bear hunting opportunities via dogs and bait would be eliminated if authorized by the Idaho Fish and Game Commission. Roadless or backcountry recreation opportunities would increase because of road closures, whereas recreation opportunities in a roaded setting would decrease. Road reclamation would likely benefit big game populations, most notably elk, and fish populations are likely to

benefit from reduced sedimentation which impacts spawning habitat. Although some people would avoid recreating in the recovery zone as a result of reintroduction, other people would increase their recreation in the area because of it. The vast majority of recreationists and resource area users would continue to use the recovery zone with little change in their trip frequency or length. Backcountry user groups such as outfitters and rafters could be impacted by increased requirements to store food and keep clean camps so as not to attract bears. Over time, recreation and visitor use of the PAA would continue to increase. No changes in hunting seasons or hunter opportunity other than the elimination of bait and dogs used in black bear hunting are currently anticipated as a result of grizzly bear recovery, although other changes could be recommended to state agencies.

Impact On Economics and the Social Environment

Impact on the Economic Value Associated with Hunter Harvest.—As discussed previously in "Impacts on Public Access and Recreational Use-Hunting Seasons", it is not expected that restoration of grizzly bears to the BE under Alternative 4 will result in any significant effect on hunter harvest of ungulates.

Data from Beecham (1995) show that 1989-1994 average annual hunter harvest of black bears using either bait or dogs in the affected area was estimated to be 87 bears. Additionally, Beecham (1995) estimated that black bear hunters in the Clearwater Region averaged 52 days of total effort per bear harvested. The potential loss in black bear hunting due to elimination of baiting and dog hunting is therefore estimated to be 4,524 days per year. This estimate likely overstates the actual potential loss due to elimination of baiting and dog hunting for several reasons. Black bear hunters using bait or dogs are likely much more successful than those bear hunters not using these techniques. Therefore, bait or dog hunters likely spend less than 52 days of bear hunting per bear taken. Additionally, it is likely that bear hunters will switch to other hunting techniques, other areas, or other species, and therefore mitigate the total reduction in hunting days resulting from the restrictions. Finally, there is evidence that declines in black bear hunting following a ban on the use of bait and dogs may be temporary and hunting may increase to near pre-ban levels after a period of time (Beecham 1995). Based on the most pessimistic assumptions of reduced hunter effort and an estimated net economic value per hunting day of $63.81 (Walsh, Johnson, and McKean 1988, average net economic value for 56 U. S. big game hunting studies updated to 1996 dollars), it is estimated that an elimination of baiting and dog hunting of black bears in the recovery zone could lead to a loss of $288.7 thousand dollars per year in net economic value associated with bear hunting.

It should be noted that these losses would only occur if the ban on baiting and dog hunting of black bears in the recovery zone were adopted by the Idaho Fish and Game Commission. Additionally, if restrictions on these types of bear hunting were adopted for reasons other than to facilitate grizzly bear recovery (for instance as a statewide referendum unrelated to the grizzly bear issue) the losses could not be attributed to grizzly recovery under this alternative.

Economic Impact on Domestic Livestock.—It is estimated that under this alternative annual losses from grizzly bear predation on livestock would range from $10,552 to $47,915. This estimated annual loss is higher than that estimated for Alternative 1. Table 4-15 shows the details of the Alternative 4 livestock predation loss estimates.

Table 4-15. Annual economic costs associated with livestock depredation under Alternative 4.[a]

Statistic	Low estimate	High estimate
Cattle lost	12	27
Average value per cow[b]	$565	$565
Sheep lost	41	355
Average value per sheep[b]	$92	$92
Total lost value per year	$10,552	$47,915

[a] During the first few decades after reintroduction, bears numbers and depredations are expected to be very low. Impacts as presented in this table would occur after grizzly bear population recovery in approximately 65-125+ years.

[b] Average value per head figures are based on an average of the Montana and Idaho value for all cattle and all sheep in the states as of January 1, 1996 (Montana and Idaho Departments of Agricultural Statistics, pers. comm. 1996).

Economic Effect of Land Use Restrictions on Recreation.—As under Alternative 1, it is estimated that recovery of grizzly bears within the BE under Alternative 4 will not lead to any significant restrictions on recreation or associated economic loss. Possible closure and reclamation of many miles of forest roads under this alternative due to grizzly bear habitat restrictions may reduce some recreational access to national forest lands in the BE. Economic losses associated with these restrictions, however, would likely be more than offset by improvements in recreational opportunities for hunters and fishermen from habitat improvements and reduced sedimentation rates in roaded areas (Christensen et al. 1993, Garrity 1996).

One aspect of restrictions on recreation which would have distributional effects within the economy concerns the imposition of regulations requiring outfitters operating within the recovery zone to use bear-proof garbage and food containers and methods when in the backcountry. The purchase of bear-proof containers or hoists would impose an additional expense on the outfitters operating within the recovery zone. These costs would represent transfers of income between the outfitters and those individuals or firms producing and selling the bear-proof products.

Economic Effect of Land Use Restrictions on Timber Harvest and of Road Reclamation Work.—Alternative 4 would prohibit future timber harvests on unroaded USFS lands within the recovery zone (Garrity 1996). Additionally, it is likely that grizzly bear habitat management would restrict to some degree timber harvests on currently roaded areas within the recovery zone (Tom Wittinger,

Flathead Forest, pers. comm 1996). Table 4-16 shows low and high estimates for annual timber harvest reductions over the next decade under Alternative 4 for both roaded and unroaded lands in the recovery zone. It is estimated that reductions in timber harvest on national forest lands within the recovery zone would be between 40 and 194 million board feet per year over the next decade if Alternative 4 grizzly bear recovery were implemented as proposed. The estimation of this harvest reduction is detailed in Table 4-16 and the notes to that table. The large variation between high and low estimates reflect divergence between the planned Allowable Sale Quantity (ASQ) of timber from Forests in the PAA and the actual harvest volume which has occurred in recent years. Additionally reflected is the difference between the percentage of annual timber volume from Forests in the PAA that is planned to be cut from roadless areas (from Forest Plans), and the percentage of annual timber volume that was actually harvested in recent years from these roadless areas. Garrity (1996) estimated that implementation of this alternative would result in an annual reduction in timber sales over the next decade of 179 million board feet. Although the methodology of Garrity differed from that presented here, his estimate is within the range of estimates developed here and presented in Table 4-16.

Associated with the estimated reduction in timber harvest would be a reduction in direct timber related employment. Estimation of the number of jobs directly supported by a million board feet of timber harvest is a difficult and complex task. Estimates vary across states, regions, and forests. Additionally, estimates vary widely depending on what is included in the definition of direct timber harvest related jobs. Still another source of disagreement between estimates is whether it is assumed that job loss occurs in a static or dynamic environment. That is, does a reduction in timber harvest in an area result in a direct proportional reduction in timber jobs, or are there complicating factors which would significantly weaken the direct link between harvest and jobs. These complicating factors might include regional markets for raw materials utilized in pulp and paper mills that lessen a local mill's dependence on local harvest, or supply response by other timber suppliers to a reduction by one source of supply, such as an increase in cutting from private timber ground following a decrease in cutting from USFS land.

The complicating factors discussed above have given rise to widely divergent estimates of direct employment per million board feet (MMBF) of harvest in the region. In 1994, Montana reported 11.58 full and part-time jobs in the forestry services, lumber and wood products, and paper and allied products standard industrial classifications per MMBF of timber harvest (Daniel Wichman, University of Montana, pers. comm.1996). Garrity (1996) reports an implied number of jobs per MMBF of harvest in the recovery area of 1.68. This estimate was based on an estimated mathematical relationship between timber harvest and forest sector jobs in Montana between 1969 and 1989. Nearly at the midpoint of these two estimates is that of Power (1992) who estimated a jobs/harvest ratio for Idaho National Forests of 6.64 jobs per million board feet. While the Montana estimate is for a different harvest area, it is generally within the range of USFS estimates cited for Idaho National Forests as well (Power 1992). The wide divergence in these estimates is due to how complicating factors, discussed above, were handled by those who developed the estimates. For the

sake of this analysis the estimate by Power (1992) of 6.64 is used. This estimate was developed with consideration of the effects of regional markets as well as the effect of multiple suppliers of timber and the dynamic nature of timber markets. Additionally, this estimate represents a compromise between the other two widely divergent estimates presented here. It must be noted that the direct jobs multiplier of 6.64 used in this report is not presented as the one true estimate of the timber-jobs relationship in the grizzly bear recovery area. Rather, it is one reasonable estimate representing one interpretation of the complexities of this relationship. The resulting job impact estimates presented in Table 4-16 should therefore be viewed as middle ground estimates.

Job losses from timber harvest reductions resulting from Alternative 4 timber harvest restrictions would be at least partially offset by job creation resulting from road reclamation work specified under the alternative. Garrity (1996) estimates that 1,501 full-time one-year jobs would be created through the road reclamation work of Alternative 4. This work would likely be spread over a number of years (Garrity 1996) and thus job creation would also be spread over a number of years.

Table 4-16. Estimated 1999-2008 annual timber harvest reductions on roaded and unroaded USFS lands within the primary analysis area (PAA) for Alternative 4.

Statistic	Low Estimate	High Estimate
Annual timber harvest on USFS lands within the PAA[a]	191	448.9
Annual reduction in timber harvest on unroaded lands within the PAA[b]	9.55[d]	141.85[c]
Annual reduction in timber harvest on currently roaded lands within the PAA	30.67[e]	51.89[e]
Total annual estimated reduction in timber harvest due to grizzly habitat management restrictions	40.22	193.74
Estimated annual loss in direct timber harvest related jobs due to timber harvest restrictions[f]	267	1286

[a] The USFS level detail behind these estimates can be found in Table 3-11.

[b] Based on Garrity (1996) it is assumed that all timber harvest on unroaded lands in the recovery zone would cease under this alternative.

[c] Based on an average expected harvest for the next decade from roadless areas in the PAA of 31.6% of total harvest expected for the PAA (Tom Puchlerz, USFS, pers. comm. 1996).

[d] Based on an actual 1992-1995 harvest from roadless areas in the PAA of 5% of the total harvest from the PAA (Randy Gay, USFS, pers. comm.1996).

[e] Based on an estimated reduction in ASQ in the Flathead National Forest of 16.9% forest-wide due to grizzly bear habitat management restrictions (Tom Wittinger, Flathead Forest, pers. comm.1996).

[f] Based on an estimated direct jobs per MMBF of timber harvest of 6.64 (Power 1992).

It is difficult to estimate the net effect on employment of Alternative 4 from the two factors of job losses due to reduced timber harvest and job creation from road reclamation work. It is clear that the road reclamation jobs detailed in Garrity (1996) are short term jobs. If the work were completed in one year, 1501 workers would be employed doing that work for the year. In the following years zero workers would be employed. If the work were accomplished over a number of years, fewer workers each year would be employed. The timber harvest jobs are more problematic to describe as predicting future harvest from USFS lands is difficult. What is clear is that timber-related job losses under this alternative would continue into the future to some degree. It may be argued that USFS land timber harvest will decline in the future and thus job loss resulting from grizzly bear habitat restrictions will also decline. However, job loss from grizzly bear restrictions will continue to some degree into the foreseeable future. Under the assumption that the timber losses detailed in Table 4-16 are constant over the next decade and road reclamation work is spread evenly over the same period, Alternative 4 employment impacts would be a net loss of between 117 and 1,136 decade-long direct timber related jobs. It should be noted that job creation from road obliteration is 1,501 full time one year jobs while the job loss is part-time and full-time jobs. Therefore the net job loss figures reported here may tend to overstate the number of full-time equivalent jobs lost in timber and related products industries. Additionally, as stated before, these job loss estimates are driven by the assumed relationship of timber employment to timber harvest. If job estimates were based on the 1994 estimates for Montana of 11.58 jobs/MMBF the net estimated job loss from this alternative would be much larger (316 to 2,094 jobs). Conversely, if estimates were based on the job-harvest ratio used by Garrity (1996) of 1.68 jobs/MMBF the net employment effect would range from a small gain in employment (82 jobs) to a moderate loss (177 jobs).

One aspect of regional employment which has not been addressed in this analysis is the relationship between extractive industries and other economic sectors. Power (1992) points out that the timber industry in Idaho accounts for only a very small percentage of total employment. Additionally, Power states that timber harvests in the Northern Rockies have been a declining source of employment in recent years. Finally, Power notes a link between economic growth in many western national forest counties and a high quality, pristine natural environment. This link implies that timber jobs associated with a continuation of timber harvest practices on both roaded and unroaded lands in the recovery zone might come at the cost of reduced natural amenity driven economic growth in the future. Alternative 4 calls for a restoration of the natural environment through reduced natural resource extraction and road reclamation. Power (1992) argues that these actions would stimulate future economic growth, and thus job growth, in the recovery zone. This offsetting natural amenity driven job growth in other economic sectors has not been estimated in this analysis of simple tradeoff between timber jobs and road reclamation jobs. Its importance should not, however, be discounted. Because of the effects of economic growth driven by a high quality natural environment, long-term employment effects of Alternative 4 may be significantly more positive than the short-term employment estimates presented here.

It is unclear what effect the offsetting factors of reduced timber harvest and increased road reclamation employment would have on federal government finances. Garrity (1996) reports that money saved the federal government by precluding below-cost timber sales in roadless areas in the Alternative 4 grizzly recovery zone over the next decade would more than amply offset the 67.1 million dollars estimated to complete the road reclamation work. (Garrity (1996) estimates a savings of 137.2 million dollars over 10 years from eliminating below-cost timber sales from roadless areas in the Alternative 4 recovery zone. Below-cost timber sales represent a market cost that is borne by all United States taxpayers.)

Economic Effect of Land Use Restrictions on Mining.— It is estimated that recovery of grizzly bears within the BE under this alternative could lead to restrictions on mining or associated economic impacts through habitat restoration programs, and USFWS Section 7 consultation on mining activities.

Economic Effect of Changes in Visitor Use.—As under Alternative 1, it is not expected that visitation will be significantly impacted in the BE under Alternative 4.

Impact on the Existence Value of Grizzly Bears.—Under Alternative 4, it is estimated that the net economic value of grizzly bear existence in the BE will be equal to that for Alternative 1.

Conclusion.—It is estimated that grizzly bear recovery in the BE under Alternative 4 will lead to total benefits of 40.4 to 60.6 million dollars per year and total costs of 728 to 765 thousand dollars per year for the first five years. The largest component of total costs would be the grizzly bear management costs of 428,632 dollars per year during the first 5 years of the recovery program. After the first 5 years when reintroductions are complete, the total cost would decrease to 487 to 527 thousand dollars per year. Additionally, it is estimated that an average of between 117 and 1,136 jobs will be lost over the next decade due to reduced timber harvest in the recovery zone (Table 4-17).

Social Impacts

Social impacts under this alternative would be essentially the same as those described under Alternative 1. Also see Appendix 19.

Table 4-17. Annual net social benefits associated with grizzly bear recovery in the BE under Alternative 4.

Category of Benefit / Loss	Type of Impact (Market / Non-Market)	Impacted Population / Area	Annual Impact (1996 dollars)	
			Low Estimate[a]	High Estimate[a]
(A) Benefits Associated With Grizzly Bear Recovery[b]				
Annual net economic value of recovery	non-market	United States population	40,449,030	60,639,180
(B) Costs Associated With Grizzly Bear Recovery				
Value of hunting losses	market and non-market	hunters and local businesses	288,700	288,700
Value of livestock losses	market	ranchers[c]	10,552	47,915
Annual grizzly bear management cost during first 5 years of program[d]	market	United States taxpayers	428,632	428,632
Net job loss from reduced timber harvest	market	local area workers and businesses	117	1,136

[a] For the benefits estimates, the low and high estimates represent a 95% confidence interval on the estimates of net willingness pay for the alternative. For the individual costs, the low and high estimates represent the best estimates of minimum and maximum costs associated with an alternative. The final net benefits figures do not represent a confidence interval but rather a plausible range of benefits associated with the alternative.

[b] Garrity (1996) in an independent economic analysis of a proposal upon which this alternative was based, presented an additional economic benefit from grizzly bear recovery, realized through a net reduction in Federal Government costs associated with elimination of below-cost timber sales in roadless areas of the recovery zone. This information is presented in the section, *Economic Effect of Land Use Restrictions on Timber Harvest and of Road Reclamation Work* (page 4-59).

[c] If a compensation program for grizzly depredation existed, the impacted population would be the contributors to the fund.

[d] After the first five years it is estimated that the Alternative 4 recovery program would cost $188,000 per year for monitoring and management.

ENVIRONMENTAL CONSEQUENCES ALTERNATIVE 4A. RESTORATION OF GRIZZLY BEARS AS A THREATENED POPULATION WITH FULL PROTECTION OF THE ESA AND USFWS MANAGEMENT

Impacts on Human Health and Safety

Impacts on human health and safety from implementation of this alternative would be similar to those described for Alternative 1. The BE grizzly bear population would be managed as a threatened population with full protection of the ESA under this alternative.

Conclusions.— During the first several decades following reintroduction, chance of injury caused by grizzly bears would be exceedingly small due to the low density of bears in the area. Under this alternative populations are estimated to achieve recovery levels of approximately 400 bears in a minimum of 65, and likely more than 125 years. Using human injury rates in the NCDE and YE, and recognizing a net increase in human visitation, projections for human injury, once bears are recovered 65-125 years in the future, are less than one injury per year and less than one grizzly bear-induced human mortality every few decades.

Impacts on Source Populations of Grizzly Bears

Impacts to source populations under this alternative would be similar to those described for Alternative 1. Reintroduction of grizzly bears into the BE would require capture and relocation of a minimum of 25 bears over a period of 5 years from other areas. Three sources of bears for the BE have been identified: southeast British Columbia, the Northern Continental Divide Ecosystem (NCDE) population in northwest Montana, and the Yellowstone Ecosystem (YE) population. An equal contribution of bear numbers would be made from Canada and the U. S. MDFWP has stated their willingness to use grizzly bears from the NCDE to augment populations elsewhere or reintroduce the species where recovery areas have been identified (Dood and Ihsle Pac 1993, page 107). An attempt was made to transplant a grizzly bear to the Cabinet Mountains from the NCDE in 1992 but trapping efforts to capture a subadult female were not successful (Kasworm et al. 1993).

Conclusions.—It appears that source areas for reintroduction of grizzly bears into the BE could be both the NCDE and/or YE (based on mortality levels) in Montana and the Kootenay Region in British Columbia, Canada. These areas have habitat similar to the BE and have sufficient numbers of bears to be a source area. Agreement to supply grizzly bears is not an assurance that bears having history of no conflict with humans, and proper age and sex will be available to the BE reintroduction program. The actual capture of the necessary bears is dependent upon access to areas with such bears, and significant effort by capture crews. Capture of desired bears is not assured, even with intensive effort. It may require more than 5 years to obtain the desired minimum of 25 bears to initiate a new population in the BE. This should be made clear to the public and to cooperating agencies at the outset. There would be no significant detrimental effects to the health of source populations because mortality limits in the Grizzly Bear Recovery Plan (USFWS 1993) and British Columbia grizzly bear management criteria (B.C. Min. Environ., Lands, and Parks 1995) would be

met during implementation of this alternative. Further, since no bears would be removed from the YE or NCDE if the mortality limits would be exceeded, and no female bears would be removed from within the recovery zone or within 10 miles of the recovery zone boundary of either ecosystem, then the effects on recovery of any removals of bears from the NCDE or YE would be nonexistent.

Impacts on Land-Use Activities

Grizzly bears would be reintroduced into the BE without an experimental population rule and would be fully protected by all provisions of the ESA as a threatened species until recovery was achieved. Because grizzly bears would be listed as a fully protected threatened species, all federal actions within the recovery zone would be subject to ESA Section 7 consultation with the USFWS.

Impacts on Timber Harvest.—Due to restored grizzly bears having threatened status under ESA, and the resulting Section 7 consultation requirements, it is likely that grizzly bear habitat management would restrict to some degree timber harvests on currently roaded areas within the recovery area (Tom Wittinger, pers. comm. 1996). Based on the best available data (Tom Wittinger, Flathead Forest, pers. comm. 1996), it is estimated that reductions in timber harvest on national forest lands within the PAA would be between 32 and 76 million board feet per year over the next decade if Alternative 4A grizzly bear recovery were implemented as proposed (see Table 4-18). Impacts to timber harvest could be less based on current land-use restrictions in Idaho that do not occur in Montana on the Flathead Forest (i.e. Pacfish, etc.). The large variation between the high and low estimates reflect the divergence between the planned Allowable Sale Quantity (ASQ) of timber from Forests in the PAA and the actual harvest volume which has occurred in recent years (see Table 3-11).

Impacts on Minerals Extraction.—Mineral extraction activities would not likely be altered due to grizzly bear concerns in and by themselves, however Section 7 consultation (on a project basis) could impact extraction activities to an unknown degree. Recommendations may be made by the USFWS to reduce potential impacts if the need arises.

Impacts on Domestic Livestock.—Impacts on domestic livestock under Alternative 4A would be similar to those described for Alternative 4 (See Alternative 4 discussion, this Chapter). Calculations of potential livestock depredation by grizzly bears indicate an estimated loss of 12-27 cattle and 41-355 sheep annually in the BE when grizzly bear populations are fully recovered at a population of 400 (Table 4-12). Because livestock are in low numbers in the northern portion of the recovery zone where bears are expected to exist in highest densities, livestock depredations could be less than either the NCDE or the YE which were used to calculate the BE estimates. These predictions are statistical in nature and are not intended to show exact depredation expected in the BE, but should provide an indication of what may occur based on other ecosystems. Livestock losses have been reduced significantly in the last 3 years through modifications in animal husbandry practices such as the use of electric fences, removal of livestock carcasses, use of guard dogs, and conscientious herding

practices (Madel 1996). There could be some expected reduction in specific allotments under this alternative.

Impacts on other private property.— Impacts to other private property under this alternative would be the same as those described for Alternative 1. Based on what is currently known about bear behavior in other ecosystems, once bears are recovered, nuisance bear incidents would likely range between 0 and 105 per year in the BE. However, by the time bears would be recovered in the BE, much more would be known about proper sanitation and avoiding many of the potential conflicts between bears and humans, and therefore, conflicts should be greatly reduced.

Conclusions.—It is likely that grizzly bear habitat management would restrict to some degree timber harvests on currently roaded areas within the recovery area (Tom Wittinger, pers. comm. 1996). It is estimated that reductions in timber harvest on national forest lands within the PAA would be between 32 and 76 million board feet per year over the next decade if Alternative 4A grizzly bear recovery were implemented as proposed (see Table 4-18). Mineral extraction activities would not likely be altered due to grizzly bear concerns in and by themselves, however Section 7 consultation (on a project basis) could impact extraction activities to an unknown degree.

Livestock grazing within the recovery zone occurs predominantly in the southern portion of the BE (Figure 3-8, Table 3-13). Consequently, at recovered grizzly population levels and current livestock stocking rates, impacts to livestock would be expected to be similar to levels occurring in portions of the NCDE and the YE. In 65-125+ years (the estimated time to recovery assuming a 4% and 2% growth rates) grizzly bears would likely be present within the southern portion of the BE. Projections indicate that at a grizzly bear population level of 400 bears in the recovery zone, yearly livestock losses to depredation by bears could range from 12-27 cattle and 41-355 sheep. Management activities would try to preempt livestock problems.

Once bears are recovered in the BE (a minimum of 65-125 years after reintroduction), nuisance bear incidents would likely range between 0 and 105 per year. However, by the time bears would be recovered in the BE, conflicts should be greatly reduced because much more would be known about proper sanitation and avoiding many of the potential conflicts between bears and humans.

Impacts on Wildlife Populations

Impacts to wildlife populations under Alternative 4A would be similar to those described for Alternative 4. Using Mattson's (1997) estimate of 1.4 or 5.8 ungulates per year for adult female and male bears respectively, a population of 400 bears would be expected to prey upon a maximum of 720 ungulates per year across the BE. This calculation assumes a 50:50 sex ratio and a 50:50 adult subadult ratio. The loss of 720 ungulates to a recovered grizzly bear population would represent 0.15% of estimated populations of ungulates in the PAA.

Annual mortality in big game can result from harsh weather, hunters, disease, predation, and other factors. These factors can interact to accentuate or negate the other. For instance bad weather may concentrate big game to make them more susceptible to hunting, predation, or disease. Furthermore an animal weakened by disease may be more susceptible to predation or winter kill. These factors make it difficult to determine whether a 0-1% grizzly predation rate would be compensatory or additive. In addition, annual fluctuations in weather can cause ungulate populations to increase or decrease by as much as 10-15%. This would likely mask any potential grizzly predation of 0-1% on ungulates within the PAA. It should therefore not be necessary to adjust hunting seasons to compensate for grizzly bear predation.

Conclusions.—In many locations, animal matter may not constitute a major annual diet item, but may be seasonally vital to bears (Mattson et al. 1991). An expected predation rate of 0.30-0.54% of the ungulate populations in the area occupied by bears in the BE could occur. Using Mattson's (1997) estimate of 1.4 or 5.8 ungulates per year for adult female and male bears respectively, a population of 400 bears (USFWS 1993) would be expected to prey upon a maximum of 720 ungulates per year across the BE. The loss of 720 ungulates to a recovered grizzly bear population would represent approximately 0.15% of estimated pre-harvest populations of ungulates in the PAA. Potential long-term impacts to black bear population dynamics is unclear, but felt to be minimal. Overall impacts of a recovered population of grizzly bears on other wildlife populations are expected to be minimal. It should not be necessary to adjust hunting seasons to compensate for grizzly bear predation on other wildlife. Any restrictions on black bear hunters or other hunting opportunities to reduce the likelihood of mistaken identity kills or to address other potential conflicts could be recommended by the USFWS, but would have to be acceptable and implemented by the IDFG and MDFWP. Grizzly bears would kill some healthy ungulates, but a large percentage of prey killed by bears will be very young, very old, sick, injured, or otherwise disadvantaged. Consequently, fewer ungulates may die from malnutrition associated with winter stress. To a small extent, competition among ungulates for food and space will be reduced, and the health of surviving ungulates may be increased an undetermined, but probably minimal amount. Impacts to other listed wildlife and fish species would be similar to those listed for Alternative 1.

Impacts on Public Access and Recreational Use

Visitor use.—Impacts to visitor use from the implementation of this alternative would be similar to those described for Alternative 1. There might be a slight decrease in visitor use under this alternative as compared with Alternative 1 due to potential road and trail restrictions and associated impacts to public access resulting from ESA Section 7 consultation with land management agencies for the "threatened" Bitterroot population. This may be offset, however, by an increase in visitors seeking a remote backcountry experience, which potential road and trail closures could help to provide. Backcountry user groups such as outfitters and rafters could be impacted by increased requirements to store food and keep clean camps so as not to attract bears.

As with Alternative 1, despite some possible temporary changes in visitation rates (up or down) as a result of reintroduction, little overall change in increasing visitation rates would be expected over time. Visitation would continue to increase as a result of expanding population pressures and the subsequent increased demand for outdoor recreation opportunities.

Road and Trail Closures.—This alternative could alter existing and ongoing land-use activities solely for grizzly bears. Grizzly bears reintroduced to the BE would be protected under the ESA as a threatened species and all federal activities that may affect grizzly bears would have to go through Section 7 consultation with the USFWS. There could be impacts to public access in the form of road and trail closures at that time. However, in the NCDE where a minimum population of about 325 grizzly bears currently exists, only one trail was closed on national forest lands because of grizzly bears in the last 10 years (USFS, Unpubl. data 1996). This closure was a result of concerns for human safety when a bear was seen feeding on an elk carcass on a trail. During the peak of the visitor use season in Glacier National Park, fewer than 5% of the trails are closed at any time as a result of safety concerns. Because of the difference between national park and national forest management, closures in the BE would likely be rare and probably be similar to the NCDE.

Also, per direction of the Grizzly Bear Recovery Plan, the USFWS is currently leading a 5-year process to assess the linkage potential between the various ecosystems identified for grizzly bear recovery. This linkage zone analysis is ongoing and will proceed. Under this alternative, USFWS would continue to coordinate research studies to determine the need for and location of linkage zones, and to identify specific habitat management guidelines necessary to maintain suitable habitat within linkage zones. If research determines that linkage zones are necessary for recovery, and that changes in habitat management within the identified zones are necessary, then the USFWS would recommend appropriate management actions.

Hunting seasons.—Under this alternative, there are no proposed changes in hunting seasons. It is predicted that a recovered grizzly bear population of 400 bears will kill a maximum of 720 ungulates per year. Interactions with other predators and the compensatory nature of some predation may affect the total loss of ungulates to predators, but at this rate only 0.15 percent of the pre-harvest ungulate population will be preyed upon by a recovered bear population. This small loss of ungulates is not expected to result in changes of big game seasons.

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Conclusions.—There could be impacts to public access and recreational use under this alternative because the reintroduced grizzly bear population would be protected under the ESA as a threatened species and all federal activities that may affect grizzly bears would have to go through Section 7 consultation with the USFWS. There could be impacts to public access in the form of road and trail closures at that time. Also, if ongoing USFWS research determines that linkage zones are necessary for recovery, and that changes in habitat management within the identified zones are necessary, then they would recommend appropriate management actions. Some people would avoid recreating in the recovery zone as a result of grizzly bear presence and other people would increase their recreation in the area because of it. The vast majority of recreationists and resource area users would

continue to use the recovery zone with little change in their trip frequency or length. Backcountry user groups such as outfitters and rafters could be impacted by increased requirements to store food and keep clean camps so as not to attract bears. Over time, recreation and visitor use of the PAA would continue to increase. No changes in hunting seasons are currently anticipated as a result of implementation of this alternative, although changes could be recommended by the USFWS to state agencies.

Impact On Economics and the Social Environment

Impact on the Economic Value Associated with Hunter Harvest.—As discussed previously in "Impacts on Public Access and Recreational Use - Hunting Seasons", it is not expected that restoration of grizzly bears to the BE under Alternative 4A will result in any significant effect on hunter harvest of ungulates.

Economic Impact on Domestic Livestock.—It is estimated that under this alternative annual losses from grizzly bear predation on livestock would range from $10,552 to $47,915. This estimated annual loss is higher than that estimated for Alternative 1. Table 4-15 shows the details of the Alternative 4 livestock predation loss estimates, and the same estimates apply for Alternative 4A.

Economic Effect of Land Use Restrictions on Recreation.—As under Alternative 1, it is estimated that recovery of grizzly bears within the BE under Alternative 4A will not lead to any significant restrictions on recreation or associated economic loss. One aspect of restrictions on recreation which would have distributional effects within the economy concerns the imposition of regulations requiring outfitters operating within the recovery zone to use bear-proof garbage and food containers and methods when in the backcountry. The purchase of bear-proof containers or hoists would impose an additional expense on the outfitters operating within the recovery zone. These costs would represent transfers of income between the outfitters and those individuals or firms producing and selling the bear-proof products.

Economic Effect of Land Use Restrictions on Timber Harvest.— It is likely that grizzly bear habitat management would restrict to some degree timber harvests on currently roaded areas within the recovery zone (Tom Wittinger, Flathead Forest, pers. comm 1996). Table 4-18 shows low and high estimates for annual timber harvest reductions over the next decade under Alternative 4A on affected USFS lands in the recovery zone. It is estimated that reductions in timber harvest on national forest lands within the recovery zone would be between 32 and 76 million board feet per year over the next decade if Alternative 4A grizzly bear recovery were implemented as proposed. The estimation of this harvest reduction is detailed in Table 4-18 and the notes to that table. The large variation between high and low estimates reflect divergence between the planned Allowable Sale Quantity (ASQ) of timber from Forests in the PAA and the actual harvest volume which has occurred in recent years.

Associated with the estimated reduction in timber harvest would be a reduction in direct timber related employment. Estimation of the number of jobs directly supported by a million board feet of timber harvest is a difficult and complex task. Estimates vary across states, regions, and forests. Additionally, estimates vary widely depending on what is included in the definition of direct timber harvest related jobs. Still another source of disagreement between estimates is whether it is assumed that job loss occurs in a static or dynamic environment. That is, does a reduction in timber harvest in an area result in a direct proportional reduction in timber jobs, or are there complicating factors which would significantly weaken the direct link between harvest and jobs. These complicating factors might include regional markets for raw materials utilized in pulp and paper mills that lessen a local mill's dependence on local harvest, or supply response by other timber suppliers to a reduction by one source of supply, such as an increase in cutting from private timber ground following a decrease in cutting from USFS land. The resulting job impact estimates presented in Table 4-18 should therefore be viewed as middle ground estimates.

Table 4-18. Estimated 1999-2008 annual timber harvest reductions on affected roaded USFS lands within the primary analysis area (PAA) for Alternative 4A.

Statistic	Low Estimate	High Estimate
Annual timber harvest on USFS lands within the PAA[a]	191	448.9
Annual reduction in timber harvest on affected currently roaded lands within the PAA due to grizzly habitat management restrictions	32.28[b]	75.86[b]
Estimated annual loss in direct timber harvest related jobs due to timber harvest restrictions[c]	215	504

[a] The USFS level detail behind these estimates can be found in Table 3-11.
[b] Based on an estimated reduction in ASQ in the Flathead National Forest of 16.9% forest-wide due to grizzly bear habitat management restrictions (Tom Wittinger, Flathead Forest, pers. comm.1996).
[c] Based on an estimated direct jobs per MMBF of timber harvest of 6.64 (Power 1992).

Economic Effect of Land Use Restrictions on Mining.— It is estimated that recovery of grizzly bears within the BE under this alternative could lead to restrictions on mining or associated economic impacts through USFWS Section 7 consultation on mining activities.

Economic Effect of Changes in Visitor Use.—As under Alternative 1, it is not expected that visitation will be significantly impacted in the BE under Alternative 4A.

Impact on the Existence Value of Grizzly Bears.—Under Alternative 4A, it is estimated that the net economic value of grizzly bear existence in the BE will be equal to that for Alternative 1.

Conclusion.—It is estimated that grizzly bear recovery in the BE under Alternative 4A will lead to total benefits of 40.4 to 60.6 million dollars per year and total costs of 439 to 477 thousand dollars per year for the first five years. The largest component of total costs would be the grizzly bear management costs of 428,632 dollars per year during the first 5 years of the recovery program. After the first 5 years when reintroductions are complete, the total cost would decrease to 199 to 236 thousand dollars per year. Additionally, it is estimated that an average of between 215 and 504 jobs will be lost over the next decade due to reduced timber harvest in the recovery zone (Table 4-19).

Social Impacts

Social impacts under this alternative would be essentially the same as those described under Alternative 1. Also see Appendix 19.

Table 4-19. Annual net social benefits associated with grizzly bear recovery in the BE under Alternative 4A.

Category of Benefit / Loss	Type of Impact (Market / Non-Market)	Impacted Population / Area	Annual Impact (1996 dollars)	
			Low Estimate[a]	High Estimate[a]
(A) Benefits Associated With Grizzly Bear Recovery				
Annual net economic value of recovery	non-market	United States population	40,449,030	60,639,180
(B) Costs Associated With Grizzly Bear Recovery				
Value of hunting losses	market and non-market	hunters and local businesses	0	0
Value of livestock losses	market	ranchers[b]	10,552	47,915
Annual grizzly bear management cost during first 5 years of program[c]	market	United States taxpayers	428,632	428,632
Net job loss from reduced timber harvest	market	local area workers and businesses	215	504

[a] For the benefits estimates, the low and high estimates represent a 95% confidence interval on the estimates of net willingness pay for the alternative. For the individual costs, the low and high estimates represent the best estimates of minimum and maximum costs associated with an alternative. The final net benefits figures do not represent a confidence interval but rather a plausible range of benefits associated with the alternative.

[b] If a compensation program for grizzly depredation existed, the impacted population would be the contributors to the fund.

[c] After the first five years it is estimated that the Alternative 4A recovery program would cost $188,000 per year for monitoring and management.